VOLUME 11 NUMBER 5 MAY 1985 **$2.95**

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Creative Computing

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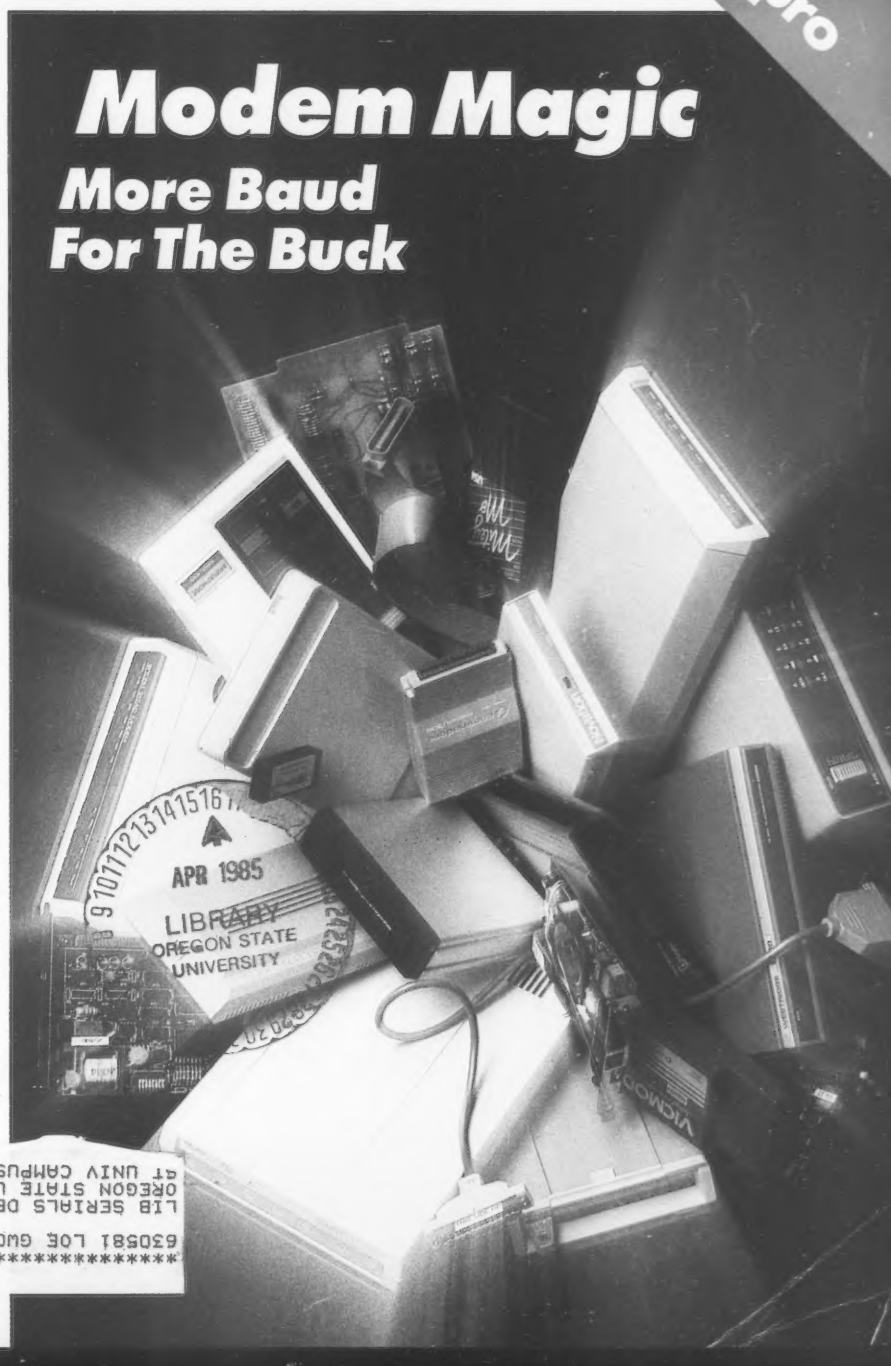

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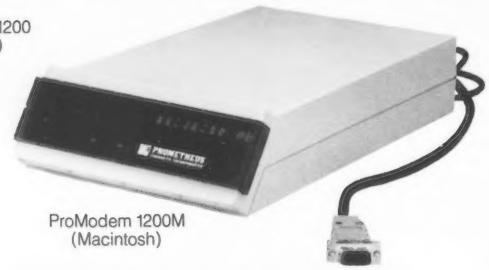

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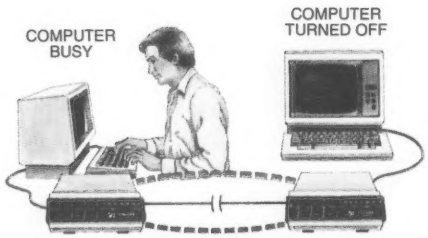

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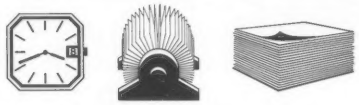

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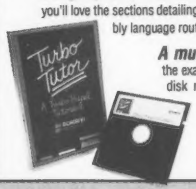

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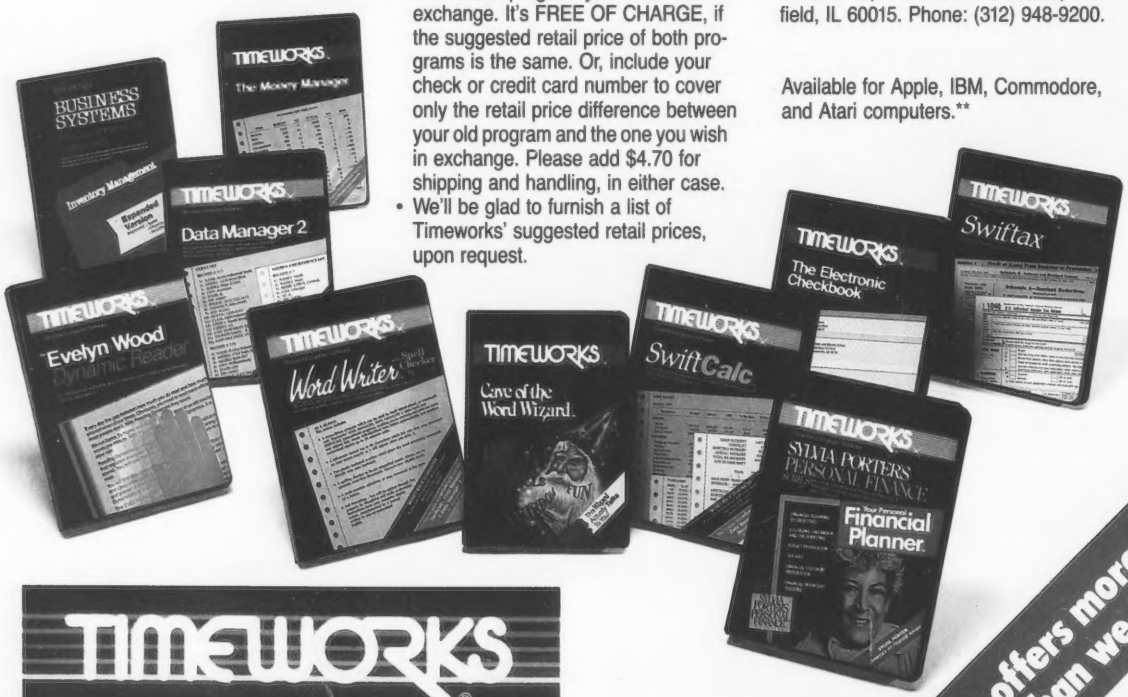

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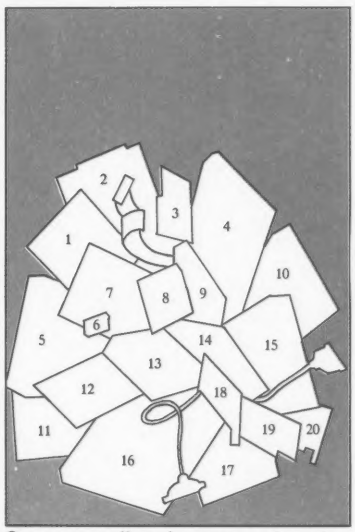
VOLUME 11 NUMBER 5 MAY 1985

Creative Computing

COVER STORY

14 **Modem Magic**/*Lockwood*
Getting the most baud for your buck



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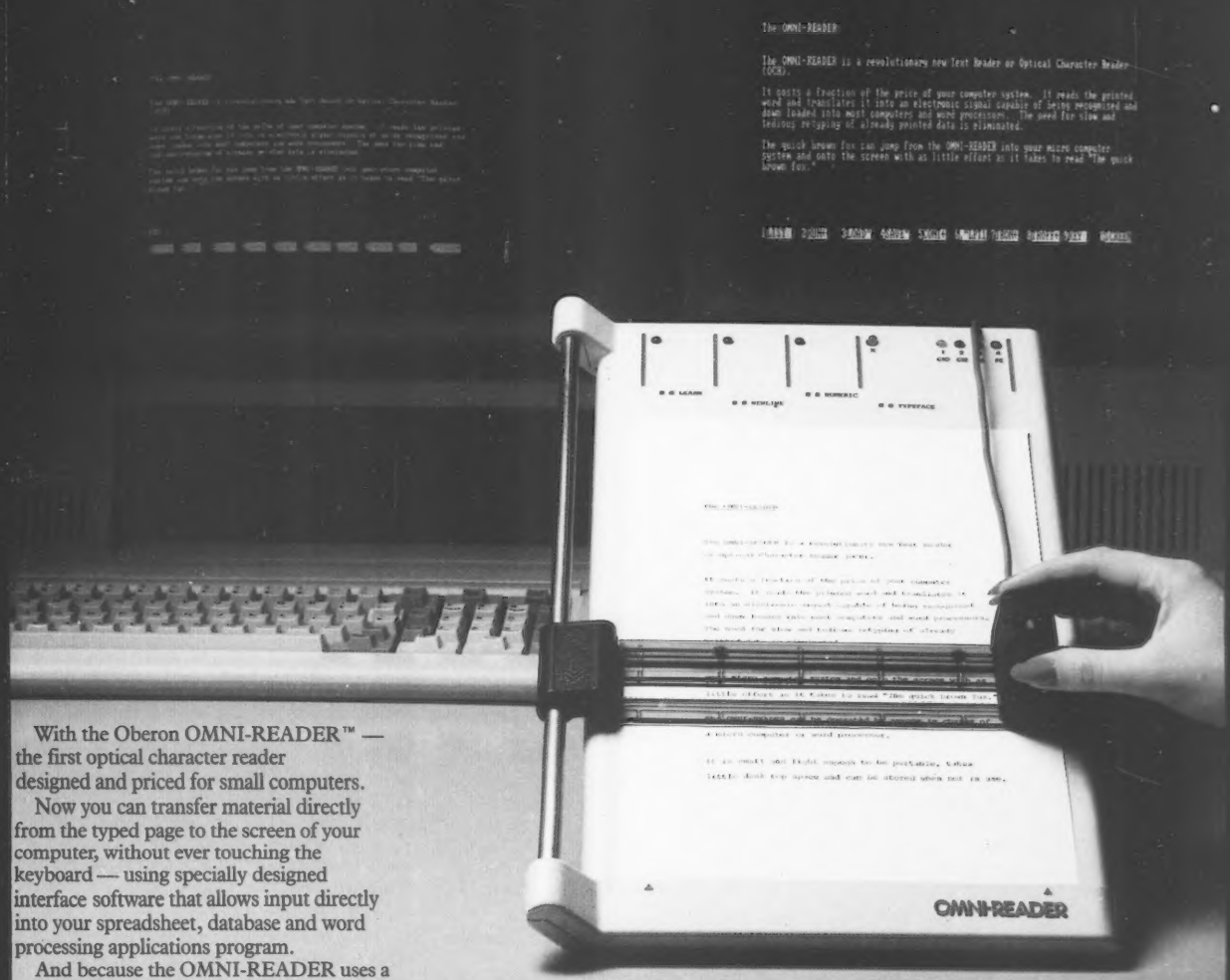
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INPUT/OUTPUT

Mega Misunderstanding

Dear Editor:

American Planning Corporation thanks *Creative Computing* for granting us space to respond to the October '84 "IBM Images" column.

MegaBasic is aimed at the top 20% of Basic programmers and the manual is written for them. Before MegaBasic, advanced Basic programmers were largely ignored. These programmers require highly technically-oriented, detailed manuals. Many programmers commented that the MegaBasic manual is superior to the IBM Basic manual. The reviewer's request for more than the 298 existing examples is negated because she failed to use the examples already in the manual, e.g., how to list a program to the printer.

Ms. Glinert-Cole misses a fundamental point of MegaBasic—it is transportable across many existing machines and operating systems, and has proven to be immediately usable on new machines, e.g., IBM PC AT. Many Basics are not transportable.

There is no Basic on the market today that has a transportable screen editor. The MegaBasic editor works identically on every terminal, even ones that do not have function keys.

MegaBasic has a context editor. It is easy to examine every READ statement or reference to array X, which is important when editing programs longer than one screen. The non-mnemonic group of editing control characters was determined by transportability requirements. APC includes a program for reconfiguring the keyboard to the programmer's personal preference. The reviewer's comments that the editor does not perform as described are not true.

Ms. Glinert-Cole states she was "irritated by the half-hearted attempt of MegaBasic to do syntax checking." MegaBasic does not do any syntax checking because statements that are currently incorrect can become correct as procedures are defined. Dynamic syntax checking restricts top basic programmers' flexibility.

The index contains two entries and there are ten LIST command examples including: LIST#1, List the entire program on the printer. APC can only conclude that the reviewer did not use the 2000+ entry index and did not read the examples when trying to print a program.

The reviewer's benchmark program ran incorrectly because its syntax was incorrect. The manual states: "To form a compound statement from several individual statements surround them with [ ]." This again appears to be a case of the reviewer not using the index or reading the manual or examples.

MegaBasic's excellent program development environment is not discussed. Programmers can enter, edit, execute, and debug multiple co-resident programs interactively, greatly speeding up program development. MegaBasic supports modifying code during execution and direct execution of any statement. There is no interpreter/compiler incompatibility as in Microsoft Basic.

There are 12 tracing commands. A programmer can dynamically select, based on a complex logical condition, which lines to single-step trace. During APC's first week after implementing the trace, internal programmer productivity increased 25%.

Another omission is that MegaBasic supports networks and controls buffering and record locking. MegaBasic has a 30-day money back guarantee. MegaBasic can easily take snapshots of the IBM screen and provide windows in customer programs.

The correct time for the MegaBasic benchmark is 2.8 seconds or 650% faster than reported. That time ranks MegaBasic first, not last, in speed.

MegaBasic now has 32-bit integers; device driver support; automatic record locking; 25% speed improvement; arrays with 65K elements; 2 billion byte files; 127 open files; PC AT support; updated index; and 461-page manual.

John E. Cleckner
American Planning Corporation
4600 Duke St., Ste. 423
Alexandria, VA 22304

Lumena Correction

Dear Editor:

We at Time Arts Inc. were excited about your review of *Lumena* on the Mindset (February 1985). We would like to give you our correct phone number, however: 707-576-7286.

Frances Corman
Technical Writer
Time Arts Inc.
3436 Mendocino Ave.
Santa Rosa, CA 95401

NOTICES

Tax Corrections

In our March round up of tax preparation packages, we inadvertently scrambled some of the information concerning Management Control Systems' *Quick-Look Tax Planner.* The corrected information appears below.

Version 84.01 of the *Quick-Look Tax Planner* runs on the IBM System/34, System/36, System/23, PC XT and PC AT. On the System /34 and System/36, it sells for $535; on the System/23, it sells for $495; and on the PC XT and PC AT, it sells for $350.

The correct address for Management Control Systems is:

2400 Lake Park Dr.
P.O. Box 723597
Atlanta, GA 30339
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In addition, the manufacturer of *Forecast* is not G&G Software, Inc., as we reported, but Monogram, located at 8295 S. La Cienega Boulevard, Inglewood, CA 90301, (213) 215-0355. IBM versions of *Dollars and Sense*, a personal financial management program, include *Forecast* for $179.95 and do not require DOS, but do require p-System, Pascal.

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CIRCLE 135 ON READER SERVICE CARD

INDUSTRY INSIDER

David H. Ahl

Future Views

IBM's share of the office market, according to a study by Future Computing, increased from 18% in 1982 to 41% in 1984, while Apple's share dropped from 22% to 11%. Nevertheless, Apple remains firmly in second place, followed by Tandy (6.3%), Compaq (4.5%), HP (3.9%), DEC and Wang (3.7% each), Zenith (3.2%), and Kaypro (1.7%) . . . The Electronics Industry Association projects home computer sales of 6 million units in 1985 and 75 million software packages (86% on floppy disk and 14% on cartridge) . . . A research study by Business Communications indicates that the market for artificial intelligence hardware and software will grow at a rate of 50% a year for the rest of the decade.

In 1984, U.S. exports of computers to China doubled to $101 million and are expected to double again in 1985. However, this increase hardly makes up for the 2.1 million tons of grain (worth about $288 million) the Chinese reneged on buying. Overall, the U.S. had a $60.5 million trade deficit with China in 1984.

Company Plans and Results

Digital Equipment Corp. has halted production of its Rainbow personal computer; it plans to sell off an estimated 10,000 machines in inventory. Angering many dealers, DEC said it would not accept returns from dealers who opt to drop the line because, said the company, the production halt is "a temporary measure" and it is "not abandoning the product." Industry observers, customers, and dealers have expressed skepticism at that statement, suggesting that the move is an attempt to ease out of the market gracefully.

Shugart, one of the oldest floppy disk drive manufacturers, was acquired by **Xerox** for $41 million in 1977. However, Shugart missed the IBM PC bandwagon, and the company's 5 1/4" manufacturing operations are being sold to **Matsushita**, a Japanese giant known in the U.S. for its Panasonic and Technics labels. A spokesman said the other operations would be sold if possible, but it was more likely that they would just be shut down . . . **Lotus** has invested $1 million in **Arity Corp.**, a ten-man firm looking into ways of adapting artificial intelligence to microcomputer software. The firm's first product is an integrated package with a user interface designed for inexperienced users . . . **Eagle Computer** is paying off some of its creditors with new common stock.

Profits and losses: 1984 sales at **Compaq** were $329 million and income was $12.8 million, both nearly three times the 1983 figures . . . 1984 sales at **Lotus** also tripled to $157 million, while earnings increased 250% to $36 million . . . **Vector Graphic**, a shadow of its former self, posted 1984 losses of $3.6 million on sales of $3.4 million . . . In the second six months of '84, **Commodore** sales dropped from $112 million a year earlier to $89 million; net loss was $5.3 million . . . **Software Publishing Corp.**, publishers of the pfs: line of software reported a doubling of sales and a profit increase of 114% in the fourth quarter . . . **HP's** quarterly net declined 56% on $1.53 billion of sales, a 20% increase from a year earlier.

Random Bits

Remember when we reported that **IBM** was buying quantities of MSX systems? Apparently the reason is that Big Blue is developing an MSX machine of their own. It is to have two built-in disk drives and an interface to a laser disc unit (from Sony); target retail price is $300 . . . We also note that IBM is selling a PCjr in Japan with 3 1/2" disk drives; it is not currently slated for the U.S. market.

Steve Wozniak, co-founder of Apple Computer, has left the company to pursue interests in the video entertainment industry. Readers will recall that Woz was one of the organizers of the Us Festival two years ago. Inside sources say that as Jobs and Sculley moved Apple more toward business markets, Woz felt ignored and unwanted.

Commodore has licensed the Perfect Software line (*Perfect Writer, Perfect Calc*, etc.) from **Thorne EMI** for its new C128 computer . . . **Tallgrass Technologies** is scrapping its current line of hard disk/tape drive units to make way for its new PC/T line of disk/tape systems. The PC/T line uses a 60Mb cartridge tape system for backup . . . **Harris Corp.** has unveiled a local area network, HarrisNet, which can couple up to 250 IBM PCs or clones together into a cluster controller . . . **Ashton-Tate** has dropped the multi-user version of *dBase II* in the U.S., although it will continue to be sold in other countries where the reception is "warmer."

As **price competition** on hardware heats up, more dealers look to software for their profits. Ask a Businessland salesman for a simple spreadsheet and word processor and chances are he'll sell you *Lotus 1-2-3* and *WordStar* for over $1000 rather than a couple of $99 packages that would meet your needs just as well. We hear that some manufacturers of low-priced software plan to take action.

The **Sesame Place** theme park in Langhorne, PA has just announced a new computer program with various courses, one-week computer camps, and training for teachers. But to teach "the latest computer techniques" the Sesame Place folks chose TI 99/4A computers; I guess they got a good price . . . In a recent Dataquest survey among **non-owners** of computers, 57% said they didn't need one and 26% said prices were too high. Other reasons for non-ownership included: "Too complicated," "I'm old fashioned," and "I'm too busy."

A machine that has been getting rave reviews in England, the **Amstrad** CPC464, is set to make its debut in the U.S. market. The graphics are spectacular and the price is right ($300-400), but I keep thinking, "Will this be a repeat of the Sinclair Spectrum?" . . . Another successful British computer, the **Sinclair** QL, has finally been scheduled for release in the U.S. in "early 1985." Price is set at $499 . . . And while we're speaking of the U.K., it should be noted that **Tandy** entered into a $10 million deal with **ACT** to convert its 49 existing Tandy Computer Centers to TA ComputerWorld stores. The stores will carry both Tandy and ACT products.

How's this for a real-time clock? A story in *The Wall Street Journal* (1/8/85) mentions that **Kaypro** "in November shipped an IBM-compatible computer than ran eight months late." ■

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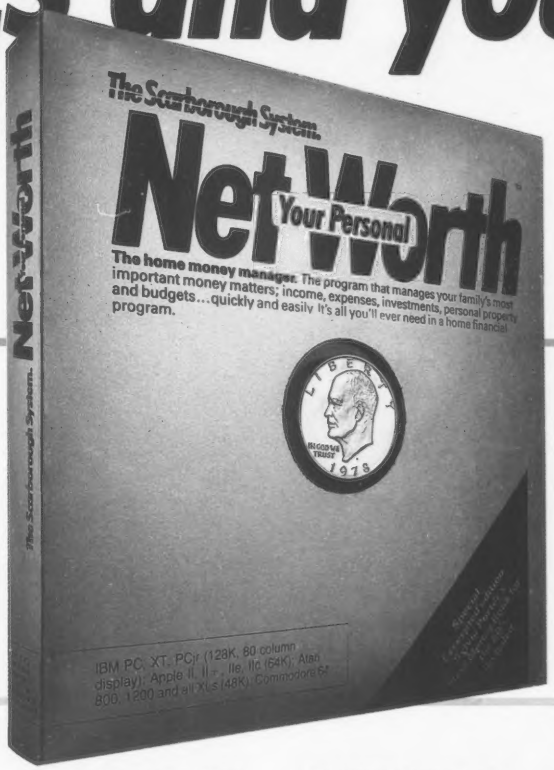
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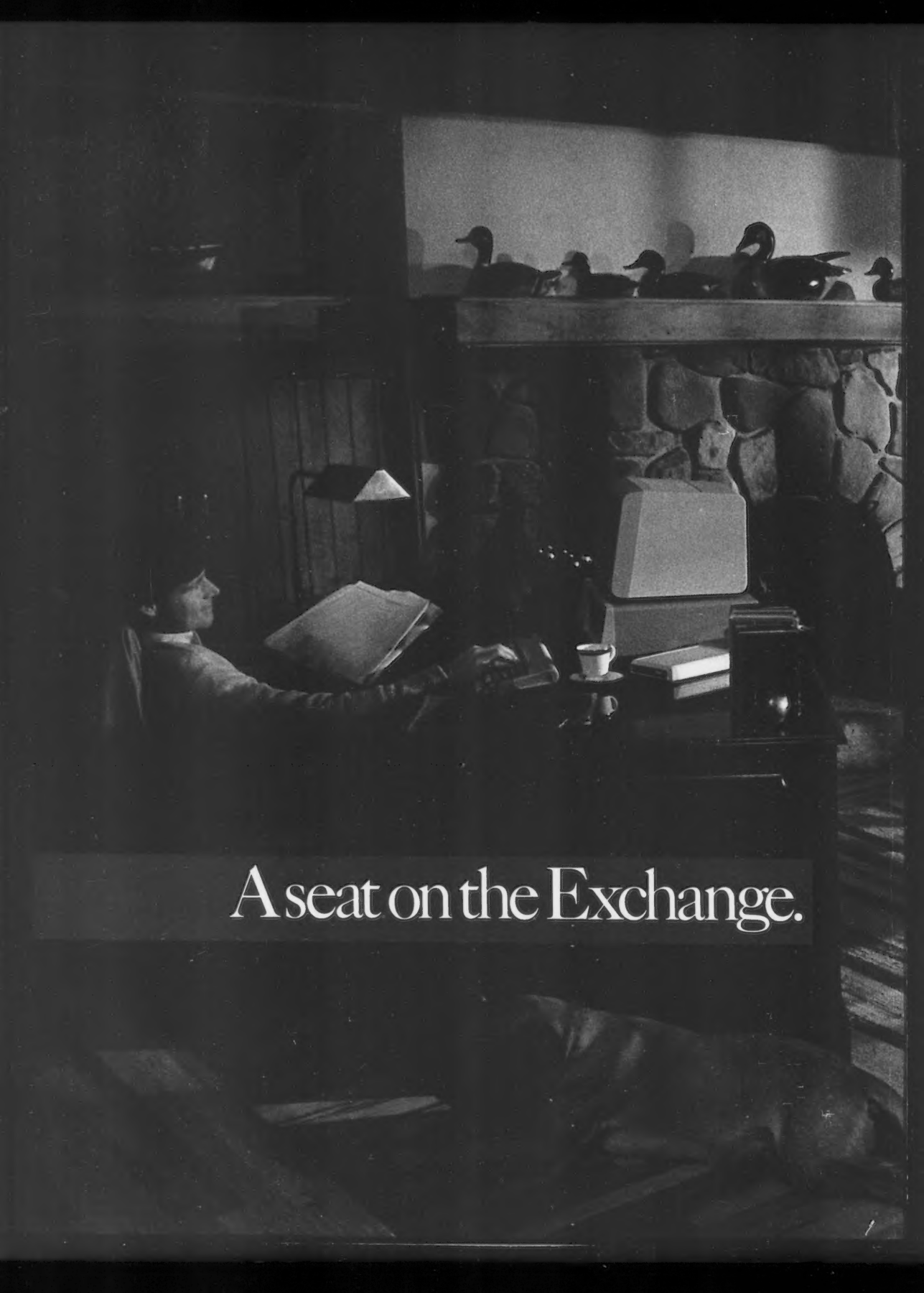
CIRCLE 123 ON READER SERVICE CARD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CIRCLE 111 ON READER SERVICE CARD

Computers and Engineering: A Winning Combination

Betsy Staples

The problem: Survey all the National Guard armories in the state of New Jersey and prepare specific recommendations for energy conservation and cost saving for each.

The solution: Lotus *Symphony*, an IBM PC, and *lots* of memory.

When William C. Baumann, a consulting engineer based in New Vernon, NJ, was awarded the contract by the State Department of Defense, he knew that he faced a mountain of data and hundreds of thousands of calculations. He also knew it was a perfect job for a computer.

Each of the State's 40 armories had to be surveyed by a person in the field using a checklist of 50 energy-related items. The data were then fed into the IBM PC where they formed the basis of the reports Baumann would ultimately give to the State.

The *Symphony* template was created by Baumann's son, Bill, whose experience with IBM and DEC minis stood him in good stead.

The database portion of the *Symphony* template includes tables containing prices of insulation, weatherstripping, storm windows, dampers, control valves, overall energy management systems, and other energy saving devices and materials. It also provides information needed to calculate the actual amount of energy to be saved in each building. "Without a computer to keep track of all this," says Baumann, "you would lose your mind."

The spreadsheet matrix is 16 x 4000, a situation that caused problems as the project progressed and memory began to run short. At the outset, they added 128K to their original 512K machine, but soon exhausted that and added another 256K to the motherboard and 512K of directly addressable memory with a plug-in ODM board from Mega-Omega Systems of Dallas, TX. Even that was to prove insufficient, and they ultimately had to trade up to a PC XT with a 10Mb hard disk.

Their original plan was to carry a Panasonic Sr. Partner to each building and enter the checklist data on site, but the matrix grew too large for the Panasonic, and they reverted to pencil and paper for the information gathering phase of the project.

Once the data have been entered, calculations can easily be done as many times as necessary to correct errors and investigate alternate plans. "In the past, it could take days to correct a single error, and we seldom had the luxury of saying 'What if. . .' Now we can try different solutions until we find the one that is best for the owner of the property being surveyed. It's actually a pleasure to make changes."

When he is satisfied with the recommendations presented by the program, Baumann prints out the finished report using a template in the word processing section of *Symphony*. Here he hit another snag. Each of the reports is 60 to 80 pages long, and his faithful Epson MX-80 was simply too slow. So he added a Hewlett Packard Laser Printer to his hardware collection and found that printing time was reduced to one quarter of Epson speed. "Five years ago," he notes, "a human typist would have spent days typing and correcting just one report."

The finished report that he presents to the Department of Defense has four primary sections: specific recommenda-

Sample conversion table from database.

CCF'S GAS		H.W.	105
COST GAS	0	...NS PER PERSON	1.5
PRESENT BIN HOURS	67,293	NUMBER OF OCCUPANT	10
SETBACK BIN HOURS	0	DAYS USE PER YEAR	312
BOILER EFFICENCY	0.68	# OF F&T TRAPS	7
NEW BOILER EFFICENCY	0.7	# OF THERMO. TRAPS	58
SEASONAL BOILER EFFICENCY	0.6	# DRILL HALL LITES	24
GROSS SQUARE FOOTAGE	15986	WATTS DRILL LITES	500
ROOF AREA 1	15986	DAILY HOURS DRILL	12
ROOF AREA 2	0	DAYS DRILL USE	24
ROOF AREA 3	0	# OF INCAN. LIGHTS	33
U VALUE ROOF 1	0.15	WATTS OF INCAN	150
U VALUE ROOF 2	0	DAILY USE INCAN	6
U VALUE ROOF 3	0	# OF EXT FLOODS	9
WALL AREA 1	0	WATTAGE FLOODS	150
WALL AREA 2	0	# OF BOILERS	1
U VALUE WALL 1	0	# SHUT-OFF DAMPERS	1
U VALUE WALL 2	0	L.F. 3/4" PIPE	0
GLASS AREA 1	1801	L.F. 1" PIPE	0
U VALUE GLASS 1	1.1	L.F. 1 1/4" PIPE	0
NEW U VALUE OF ROOF 1	0.06	L.F. 1 1/2" PIPE	0
NEW U VALUE ROOF 2	0	L.F. 2" PIPE	0
NEW U VALUE ROOF 3	0	L.F. 2 1/2" PIPE	0
GALS OF FUEL COND./1000	0.5	L.F. 3" PIPE	0
BTU PER UNIT FOR DHW	11600	L.F. 4" PIPE	0
CFM CAULKING CRACK	0.43	L.F. 5" PIPE	0
L.F. CAULKING CRACK	1139	PERCENTAGE WIND	0.5
# OF RAD. VALVES	0	COST PER DAMPER	$1,400
AREA OF ATTIC SPACE	0	# OF SKYLIGHTS	0
U VALUE OF ATTIC	0	U x A FOR ZONE	0
NEW U VALUE OF ATTIC	0	PRESENT HOURS	0
# OF BOILERS FOR TURBOS	0	NEW HOURS	0
AREA OF SKYLIGHTS	0	COST FOR ZONING	$0
# OF OPTIMIZERS	1		

Sample summary from finished report.

```
Cost per Kw...ectricity          $0.1310
Cost of Fixture                    $130
BTU per KWH Electricity           11600

SAVINGS = Existing Wattage = # of Fixtures x Watts per Lamp
          New Wattage      = # of Fixtures x Watts per Lamp
          ------------------
          Watts Saved per Hour

                1350   =        9        x      150
              -  630   =        9        x       70
              -------
                720

Watts Saved/Year  =  Watts/Hr.  x  Days Use  x  Hours Use/Day
    2628000             720        365              10

KWH Saved per Year =  Watts Saved    /    1000
        2628           2628000          1000

Dollars Saved     =  KWH Saved       x   Cost per KWH
      $344              2628            $0.1310


Cost of Implementation =   # of Fixtures x Cost per Fixture
      $1,170                       9              $130


1.  SOURCES FOR CALCULATIONS:
    1. ENERGY MANAGEMENT, Ottaviano Technical Services, 1984
```

tions (replace faulty steam traps, replace incandescent light fixtures, caulk window frames, etc.), details of the costs associated with each recommendation, the payback period on each recommendation, and a list of sources (engineering calculations, price lists, etc.) used in preparing the report. These topics are discussed in detail in the narrative section of the report and summarized in tabular form.

Is the system worth the time and money Baumann and his son put into it? "Definitely. The system has definitely paid for itself.

"The computer has cut our work by about 10 to 1, and by allowing us to investigate innumerable permutations, we can do a better job for the owner of the property," Baumann says. Ongoing government surveys of schools and other public buildings should ensure that Baumann's computer system remains productive for some time to come.

The Other Side of the Coin

Another computer system that allows Baumann to do a better job for his clients is the *Carrier 2000Jr.* computer aided design package that also runs on his PC. In contrast to the *Symphony*-based system, the CAD system enables him to do a better job not by saving time but by allowing him to produce better quality drawings that can be changed easily and are less subject to error than drawings produced manually. "Frankly, I can do the drawings much faster by hand; it is the ability to make changes quickly and easily that makes the system worthwhile."

The package, which consists of a 512K IBM PC, an HP 7475A Plotter, a Bausch and Lomb DT-11 digitizer, two monitors—one monochrome and one color—and software supplied by the Carrier Corporation, is designed specifically for architects and engineers. The designer uses the digitizer to draw the individual systems of a building (lighting, cooling, heating, plumbing, etc.) in different colors. The various systems can then be superimposed on one another to provide a complete picture of the building.

Being able to see all of the systems together makes it possible for the designer to spot conflicts before installation. Corrections can be made immediately, and a change made on one system or layer is automatically made in the appropriate place on all the others. "This makes installation in the field easier and cheaper."

Like *Symphony*, the Carrier package allows Baumann to experiment with different designs and choose the best one for his client.

His one criticism of the high tech industry that has changed his business so dramatically is that "it is virtually impossible for the average businessman to get the equipment to work without a great deal of help." Each time he added a new piece of hardware, work on the project would come to a halt while he and Bill tried to decipher the documentation and figure out why things didn't work as they were supposed to.

"I know that people who set up their own computer systems five years ago had a really hard time," Baumann says, "but it really shouldn't be that way today." ■

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CIRCLE 139 ON READER SERVICE CARD

Modem

In the squat ivory tower that houses our editorial offices, telecommunications is one of the hottest topics around. Our survey in the February issue indicates that it is popular among readers as well. The increased sales of hardware and software products, coupled with a proliferation of on-line services, reflects this trend. All across the market, from the low end to the upscale, people are discovering the ease, speed, and convenience of telecommunications.

The key to unlocking this long distance power is a modem, a device that allows computers to communicate with one another over common telephone lines. It translates the digital signals of your computer into the analog signals recognized by the telephone system. A modem at the other end of the line converts the analog signals back into digital form.

This process is called modulation-demodulation, and the modem derives its name from what it is: *mo*dulator-*dem*odulator.

Modems generally use either synchronous or asynchronous communication. Synchronous modems organize data into blocks and transmit all the blocks at one time. Asynchronous modems send data in a long stream, one character at a time. The vast majority of modems for microcomputers are asynchronous.

Long Distance Chaos

A computer creates digital signals by using bursts of voltage, representing on and off (1 and 0). These binary electrical signals must be precise; any deviation causes errors in the data.

On the other hand, the telephone system transmits analog signals, which carry information over the lines using fluctuating electrical voltage that reacts to changes in sound pressure. The louder you talk into a telephone, the higher the voltage in the line.

Both types of signal run into problems during long distance transmission. The longer the distance between communication points, the weaker and more distorted the signal. Eventually, both digital and analog signals fade into unrecognizable static.

The telephone company solves the problem by using special analog filters and amplifiers that select and boost a limited bandwidth of comprehensible voice communication frequencies. Signals outside this range of 300 Hz to 3300 Hz are discarded.

Unmodulated digital signals receive a hostile welcome from the telephone lines. The filtering and amplifying blur the precise signals. General line noise mimics digital pulses and produces echoes. If a signal falls outside the 300 to 3300 Hz range, it is discarded. All this adds up to distorted transmissions.

To avoid these problems, a modem changes digital signals into audio tones and transmits these tones over specific frequencies. And just as different voltage bursts in a computer represent on and off (1 and 0), so the modem uses different audio frequencies to duplicate on and off patterns.

Since telecommunication is usually two-way, a modem uses two sets of tones to distinguish the data it transmits from the data it receives. Furthermore, to coordinate the tone frequencies, one modem acts as a signal originator and the other acts as a signal answerer.

Figure 1 shows the frequencies used by the most common type of modem (AT&T Bell 103 standard). The technical term for this modulation-demodulation technique is Frequency Shift Keying. The signal originator transmits at one pair of frequencies, which is the exact pair of frequencies the signal answerer expects to receive. Notice that when the signal answerer sends data to the originator, the two sets of transmitting and receiving frequencies also match.

The proper term for simultaneous, two-way data transmission is full-duplex. As you may have guessed, one-way data transmission is called half-duplex. Just about all Bell 103 standard modems are full-duplex.

Greased Lightning

The data you send over a telephone line uses a code called ASCII, short for American Standards Code for Information Interchange. Each transmitted character (letter, number, punctuation, or symbol) is made up of seven bits, has two more framing bits to tell each computer when the bit pattern for a character starts and stops, and may include one or two parity bits for error checking. All told, a single character can be up to 11 bits long.

The speed of a modem is measured in bits per second, more commonly referred to as baud. Actually, baud is something of a misnomer, referring to the number of times a modem signals another modem. At first, bits per second

Photography by Jeff MacWright.

Modem Magic

More baud for the buck: A buyer's guide to understanding, choosing, and using modems

by Russ Lockwood

and baud could be used interchangeably, but with advances in technology, differences have appeared. Nevertheless, baud remains a popular, if slightly improper, term for transmission speed.

Back in the days of the Teletype machine, transmission speed was a hair-raising 110 baud, roughly 10 or 11 characters per second. The Bell 103 standard mentioned above transmits at a maximum of 300 baud, or roughly 30 characters per second.

Transmission speeds faster than 300 baud are possible using the Frequency Shift Keying modulation technique. However, full two-way communication places some of the rapidly shifting frequencies outside the limited bandwidth of 300 Hz to 3300 Hz. As mentioned above, signals outside this range are discarded.

To meet the need for higher speed, AT&T introduced the Bell 202 standard. While technically a full-duplex modem, it allows 1200 baud transmissions in only one direction. The return channel is only five baud, which is practically useless for transferring long files. Although cumbersome, a Bell 202 standard modem can be used for half-duplex telephone communication. In this case, the parties must take turns sending data at 1200 baud.

Modem Wars

The breakthrough came in late 1972, when Racal-Vadic introduced the VA3400, a full-duplex 1200 baud modem. The VA3400 uses Quadrature Amplitude Modulation, one variation of a technique called Phase Shift Keying, to make the digital-analog signal conversion. As before, one modem functions as the signal originator while the other is the signal answerer.

The signal originator transmits a constant signal at 2250 Hz, and the signal answerer transmits a constant signal at 1150 Hz. Instead of changing frequencies as in Frequency Shift Keying, Quadrature Amplitude Modulation keeps a constant frequency but changes the starting point of the analog sound waves. The modem sends out an electronic marker and regularly checks to see where that marker is in relation to the incoming waves from the other modem. The "Quad" refers to the four positions at which the modem detects the marker —the top of the wave, the bottom of the wave, midway between the top and bottom on the "up" side, and midway between the top and bottom of the "down" side. Each position actually represents two bits (called dibits) of information.

AT&T Strikes Back

In 1976, AT&T introduced its own full-duplex 1200 baud modem, the Bell 212A standard. This modem uses a variation of Phase Shift Keying technique, called Four Phase Differential Phase Shift Keying, which is completely incompatible with Quadrature Amplitude Modulation. The signal originator transmits at 1200 Hz, and the signal answerer transmits at 2400Hz, roughly the opposite of the VA3400 from Racal-Vadic.

Most 1200 baud modems use the Bell 212A standard, just as most 300 baud modems use the Bell 103 standard. The VA3400 and Bell 202 protocols are not extinct. Indeed, many information services offer VA3400 compatibility. However, Bell 212A is significantly more popular than either of them.

The rest of the world does not recognize the Bell 212A standard. Instead, by treaty, other countries have settled on an incompatible standard called V.22 put forth by the Consultive Committee on International Telephone and Telegraph (CCITT). It uses a different modulation technique operating on different frequencies.

Return of the Innovator

At this time, 11 companies—Racal-Vadic, US Robotics, Hayes Microcomputer Products, Multi-Tech Systems, Novation, Micom, Penril DataComm, Case Rixon, Gandalf Data, Concord Data Systems, and Cermetek Microelectronics—have introduced 2400 baud modems, and others are soon to follow. AT&T also introduced a 2400 baud modem, but the Bell 2224 protocol has yet to catch the fancy of the industry.

Predicting which protocol will succeed as the 2400-baud industry standard is difficult to do. Essentially, manufacturers are cramming 2400 bits where 1200 bits used to be using a variation of Phase Shift Keying. There seems to be some consensus in using adaptive equalizing techniques to preserve signal quality and prevent errors, but that is not a transmission technique.

CCITT already has specifications for 2400 baud modems: V.22bis. Only time will tell whether it becomes a North American standard, but most of the manufacturers are offering CCITT compatibility with their 2400 baud modems.

Figure 1.
AT&T Bell 103 Standard
Full duplex, 300 baud
Frequency Shift Keying Modulation

		Transmit	Receive
Signal Originator	On (1)	1270Hz	2225Hz
	Off (0)	1070Hz	2025Hz
Signal Answerer	On (1)	2225Hz	1270Hz
	Off (0)	2025Hz	1070Hz

Glossary

Acoustic coupler: A primitive type of modem with rubber cups to cradle the handset of a telephone.

Analog signals: The tones carried over telephone lines.

ASCII: The standard code used to represent letters, numbers, and symbols as bit patterns.

Asynchronous: Sending data in series, one bit at a time.

Baud: A common term applied to transmission speed. In most cases, baud is nearly the same as bits per second.

BBS: Bulletin Board Systems. Electronic meeting places usually operated by individuals using their home systems.

Bell 103: The AT&T standard full-duplex 300 bps modem.

Bell 212A: The AT&T standard full-duplex 1200 bps modem.

Bps: Bits per second, the speed at which data are transmitted.

C line: A better-than-average phone line leased for private use. These are graded C-1, C-2, etc.

DB-25: The standard connector between an external modem and a computer.

Direct connect: This design allows a modular telephone cord to plug directly into a modem.

Downloading: Receiving information electronically and saving it to disk.

Full Duplex: The simultaneous transmission of data in two directions.

Half duplex: The transmission of data in one direction.

Leased line: A private line leased exclusively by one customer.

Log-on: The process of accessing a telecommunications service.

Modem: Contraction of modulation/demodulation, the process of converting digital signals into analog signals and back again.

RS-232C: The standard serial interface for telecommunications.

Synchronous: Transmitting data in blocks.

Uploading: Sending information electronically and storing it at a remote site.

3002: The standard grade leased line.

Several manufacturers offer modems with speeds of 9600 baud and beyond. Some of them use Phase Amplitude Modulation, another version of Phase Shift Keying. Note that these high-speed modems are usually reserved for mainframe communications. In any event, one of these superfast modems can cost more than your entire computer system.

A Port of Call

Back in 1969, the Electronics Industry Association adopted RS-232 as a standard for serial communication between data terminal equipment (your computer) and data communication equipment (the modem). RS-232C stands for Recommended Standard 232 Version C and is indeed the industry standard port for telecommunications.

Among other things, RS-232C calls for a 25-pin connection between modem and computer and specifies which signal each pin carries. Thus, pin 1 is a ground, pin 2 transmits data, pin 3 receives data, and so on.

The more-or-less standard connector to the RS-232C port is called DB-25. It derives its name, in part, because it is shaped liked the letter D. Most, but not all, computers and modems use a female DB-25 connector, which means the intervening cable requires male DB-25 connectors at each end. However, the IBM PC communications card, for example, has a male DB-25 connector, which means you need a female connector on one end of the modem cable and a male connector at the other.

Note that many modems do not send signals through all 25 pins. Ignoring a few pins is perfectly acceptable. A manufacturer is said to support RS-232C as long as the signals do not directly violate it. Many modems will function using only pin 2 (transmit data), pin 3 (receive data), and pin 7 (signal ground).

Finally, the modem must be connected to the telephone system—a task often accomplished by plugging the line from the modular phone jack on the wall into the modem. Although this should go without saying, in more than a few cases, novice telecommunicators have neglected to perform this step, producing far from satisfactory results.

A Fist Full of Features

Now that you understand the fundamentals of how modems operate, what features should you look for? Choosing a modem takes as much time and effort as choosing a printer or monitor—certainly the costs are roughly the same. As always, your decision should reflect your needs. It should meet your current requirements and allow for future growth. Contrary to marketing claims, many people just do not need the fastest, fanciest, and costliest modem around.

Speed

Basically, you can choose from 300 baud, 1200 baud, and 2400 baud modems. Quite often, the higher speed modem also includes the electronic circuitry for the lower speeds. Thus, one of the most popular combinations around is a 1200/300 baud modem.

A 1200 baud modem is four times as fast as a 300 baud modem. Likewise, a 2400 baud modem is twice as fast as a 1200 baud modem. To give you an idea of the difference in transmission time, a 10,000-word data file should take approximately three minutes to send at 2400 baud, a little over six minutes at 1200 baud, and an agonizing 24.5 minutes at 300 baud. Clearly, if you routinely transmit and receive long files, and the business axiom "time is money" applies, the higher speed is desirable.

On the other hand, a 2400 baud modem for accessing a consumer telecommunications service represents overkill. If you are using the Source to "chat" or CompuServe to play games, a 300 baud modem works just fine. Most people do not type 30 characters a second, and waiting around for the mainframe to execute your command does not take advantage of that super speed.

Note that most telecommunications services charge extra for using faster speeds, and many do not support 2400 baud transmission. Also note that many networks (Tymnet, Uninet, MCI, et al.) are not capable of 2400 baud communication. This is probably a short-term problem though.

Also remember that you need modems of equal speed at both ends of the line. A 1200 baud modem cannot directly connect with a 300 baud modem at 1200 baud—it needs to go down to 300 baud. Likewise, you need compatible modems at each end. Buying a VA3400 modem will not let you directly connect with a Bell 212A standard modem.

Type

Modems come in two types: acoustic and direct connect. Acoustic modems were first on the market, in part because AT&T held a monopoly on direct con-

nection into the telephone system. The handset of the phone fits snugly in the two rubber cups of an acoustic modem: one holds a speaker to generate tones and the other holds a microphone to receive tones sent by the modem at the other end of the line.

Direct connect modems bypass the telephone entirely. You plug the line from the modular jack on the wall directly into the modem.

Direct connect modems are by far the more reliable. Acoustic modems are notorious for picking up external noise that results in transmission errors. Many of the handsets on newer telephones do not fit in the cups, which increases the risk of errors. While direct connect modems are generally more expensive than acoustic modems, the improved signal quality is worth the extra cost.

However, older houses may not have the modular plugs needed by direct-connect modems, so unless you want the phone company to install a new jack (or you do it yourself), an acoustic modem is your only choice.

Many direct-connect modems provide a second jack on the modem itself to hook up the telephone. You can use either the modem or the telephone; this handy arrangement relieves you of the chore of plugging and unplugging the

Who Ya Gonna Call?

The more popular telecommunications services include:

American People Link
Arlington Ridge Office Center
3215 N. Frontage Rd.
Arlington Heights, IL 60004
(312) 870-5200
(800) 524-0100

This newcomer to the telecommunications service market offers electronic mail, partyline, special interest groups, and a section to find subscribers with similiar interests. It does not have the variety of CompuServe or The Source, but at roughly half the cost, it is especially affordable.

Bibliographic Retrieval Service
1200 Route 7
Latham, NY 12110
(518) 783-1161

Industry leader supplies a host of databases covering just about every topic you can think of, from business management to psychology to family planning. It offers expensive daytime service for businesses and a smaller, less expensive evening service for the home.

CompuServe Information Services
P.O. Box 20212
5000 Arlington Centre Blvd.
Columbus, OH 43220
(800) 848-8199
(614) 457-0802

The largest full-service telecommunications service around provides a multitude of information, education, and entertainment services. Electronic mail, CB simulator, and special interest groups (like the Creative Computing SIG at PCS-22) make this a good overall choice.

Delphi
General Videotext Corp.
3 Blackstone St.
Cambridge, MA 02139
(800) 544-4005
(617) 491-3393

A relative newcomer into the telecommunications field, the service is a smaller version of CompuServe and The Source, with information, education, and entertainment services. Electronic mail is sophisticated and allows you to send messages to CompuServe and Source subscribers.

Dialog Information Services
3460 Hillview Ave.
Palo Alto, CA 94304
(800) 227-1927
(800) 982-5838
(415) 858-3785

Established in the 1960s by Lockheed, this service offers over 200 databases covering all sorts of topics, especially those concerned with business and the sciences. The service is so sophisticated, it offers on-site training.

Information Access Company
11 Davis Dr.
Belmont, CA 94002
(800) 227-8431
(415) 591-2333

This service offers full-text electronic versions of your favorite magazines, including *Time, People, Life, Fortune, Sports Illustrated,* foreign journals, and Ziff-Davis publications such as *A+, PC,* and *Creative Computing.*

ITT Dialcom
1109 Spring St.
Silver Spring, MD 20910
(301) 588-1572

Worldwide electronic mail system.

MCI Mail
P.O. Box 1011
1900 M St. NW
Washington, DC 20036
(800) 424-6677
(202) 833-8484

Electronic mail service offers instant delivery to other subscribers. It also can send (paper) letters to non-subscribers within four hours, guaranteed overnight, or within a day or two.

NewsNet Inc.
945 Haverford Rd.
Bryn Mawr, PA 19010
(800) 345-1301
(215) 527-8030

Just as Information Access Company provides full-text electronic versions of magazines, so NewsNet provides full-text electronic versions of newsletters, with an emphasis on business topics.

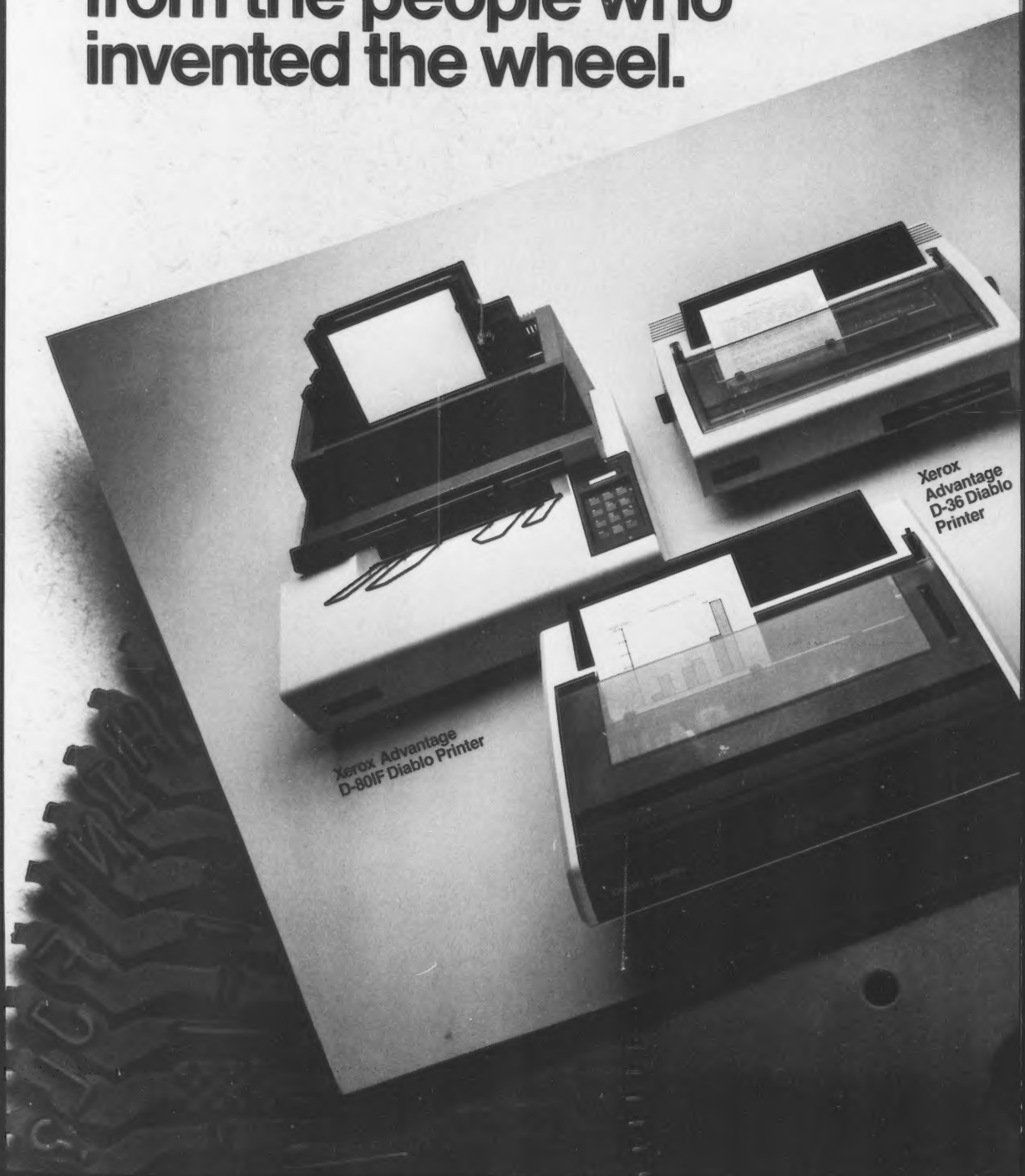
PlayNet
200 Jordan Rd.
Troy, NY 12180
(518) 273-0443

PlayNet has just opened the lines to its home telecommunications service. It offers electronic mail, Talk, and a variety of simple games. The big draw is use of the graphics of your computer to play the games. Available for the Commodore 64, with versions for the Apple and IBM computers coming soon.

The Source Information Network
1616 Anderson Rd.
McLean, Va 22102
(800) 336-3366
(703) 821-6666

Another full service telecommunications service to rival CompuServe. It charges more, but includes a slightly easier command structure. Electronic mail, entertainment, education, and stock quotes are among the services.

Three more firsts from the people who invented the wheel.



XEROX

From day one, Xerox and Diablo have been known as the two best names in daisywheel printers. And now there are three more in the Xerox line to choose from.

The Xerox Advantage D-25 Diablo printer turns out letter quality documents quickly and quietly. And it does all that for the price of a dot matrix printer. At 80 c.p.s., the D-80IF is the fastest daisywheel printer ever made by Xerox. It has a built-in double bin sheet feeder. As well as the capacity to handle up to 16 computers at once.

And the D-36 spells reliability. It averages 4,000 hours of printing between maintenance calls.

But Xerox didn't stop there. Each of these new machines is compatible with most computers on the market, including the IBM-PC. And they're all easy to use.

They're also a part of Team Xerox, so they can be serviced by the national Xerox service force and authorized service locations across the country.

So if you're looking for the latest in daisywheel printing technology, go with the people who've been in the business the longest. Call 1-800-833-2323, ext. 25, your local Xerox office, an authorized Diablo or Xerox dealer or send your business card to Xerox Corporation, Dept. 25051, P.O. Box 24; Rochester, NY 14692.

FOR MORE INFORMATION FROM XEROX
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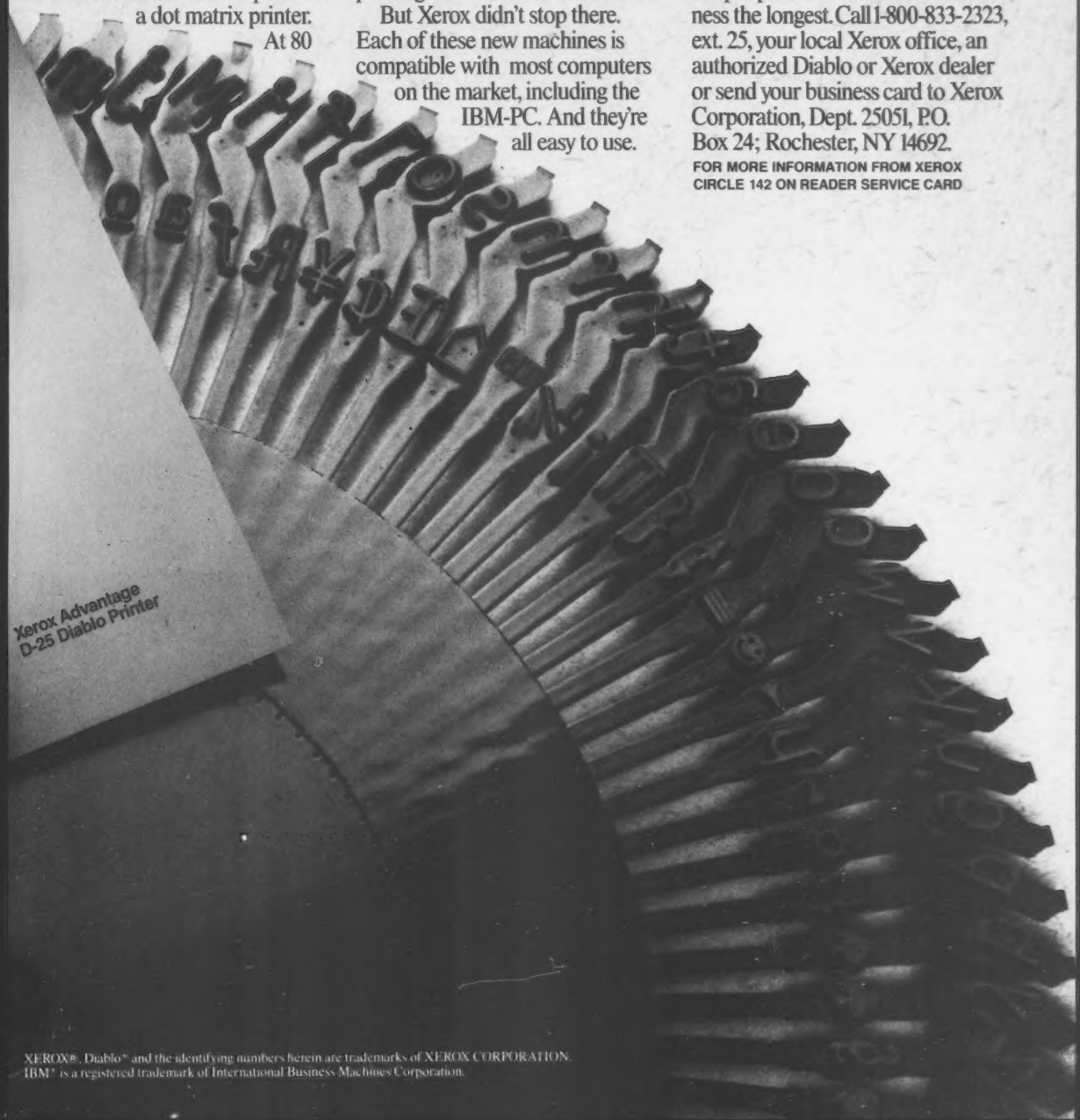

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IBM® is a registered trademark of International Business Machines Corporation.

Modem Comparison Chart

Manufacturer	Model	Price	Type	Installation	Speed	Bundled Software
Anchor Automation Inc. 6913 Valjean Ave. Van Nuys, CA 91406 (818) 997-7758	Volksmodem Volksmodem 12 Mark XII Mark X Express	$79.95 $299 $399 $169 $439	DC DC DC DC DC	External External External External External	300 1200/300 1200/300 300 1200/300	- - - - -
Anderson Jacobson 521 Charcot Ave. San Jose, CA 95131 (408) 263-8520	AJ 1212-AD2 Connection AJ 1212-ST	$695 $599 $495	DC DC DC	External Internal (IBM PC) External	1200/300 1200/300 1200/300	- Crosstalk XVI -
Apple Computer Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	Modem 300 Modem 1200	$225 $495	DC DC	External External	300 1200	- -
Ark Electronic Products 325 Hibiscus Blvd. Melbourne, FL 32901 (305) 724-5260	Model 24K	$805	DC	External	2400/1200 300	-
AST 2121 Alton Ave. Irvine, CA 92714 (714) 863-1333	Reach!	$549	DC	Internal (IBM PC XT short slot)	1200/300	Crosstalk XVI
AT&T Consumer Products 5 Wood Hollow Rd. Parsippany, NJ 07054 (201) 581-5185	Model 4000 AT&T 103 AT&T 2212C/FDX AT&T 2224/FDX	$499.95 $605 $750 $1045	DC DC DC DC	External External External External	1200/300 300 1200/300 2400/1200/300	- - - -
Atari 1265 Borregas Ave. Sunnyvale, CA 94086 (408) 745-2000	835* 1030* *Last known	$279.95 $130.95	DC DC	External External	300 300	Telelink Modemlink
Bizcomp 532 Mercury Dr. Sunnyvale, CA 94086 (408) 733-7800	Intellimodem ST PC:Intellimodem Intellimodem XT Bizcomp 1012 Versamodem	$499 $499 $549 $549 $875	DC DC DC DC DC	External Internal (IBM) Internal (IBM) External External	1200/300 1200/300 1200/300 1200/300 300	Intellisoft Intellisoft Intellisoft - -
Bo-Sherrel Co. 36133 Niles Blvd. Fremont, CA 94536 (415) 792-0354	M-1A (short-haul 2-10 miles)	$138	DC	External	600/9600	-
Bytcom 2169 Francisco Blvd. San Rafael, CA 94901 (415) 485-0700	212 AD	$495	DC	External	1200/300	-
Case Rixon Communications Inc. 2120 Industrial Pkwy. Silver Spring, MD 20904 (301) 622-2121	R1224 Executive 212 PC 212A	$799 $599 $499	DC DC DC	External Ext or Int Internal (IBM PC)	2400/1200/300 1200/300 1200/300	- - PC Comm
Cermetek Microelectronics 1308 Borregas Ave. P.O. Box 3565 Sunnyvale, CA 94088 (408) 734-8150	Security Modem Infomate 1200 Infomate 1200P	$695 $595 $495	DC DC DC	External External Internal (IBM)	1200/300 1200/300 1200/300	- - -
Code-A-Phone P.O. Box 5656 Portland, OR 97228 (800) 547-4683	Tel-A-Modem	$695.95	DC	External (combo modem/ telephone)	1200/300	-

telephone every time you use the modem.

Internal Versus External

This is one debate that has no clear-cut answer. Both types have numerous advantages and disadvantages. The choice is really a personal one.

An internal modem (an expansion board) fits into an expansion slot inside your computer. An external modem resides outside, connected via an RS-232C port and a cable.

Internal modems tuck neatly away inside the system unit, are automatically transported with the computer, and require no serial port, modem cable, or external power supply. On the other hand, they occupy valuable expansion slots, increase internal heat, show no external lights, can be reset only by turning the computer off and on, and cannot be transferred to an incompatible computer (you cannot use an Apple internal modem inside an IBM PC).

External modems are easily ported to other computers, have lots of indicator lights, have power on/off switches for instant reset, and include DIP switches for special use. On the negative side, they require desk space, a power adapter, a cable between computer and modem, and a special serial communications card (or the capability on a multifunction card).

You may want to give additional consideration to an external modem only because of portability. If you upgrade from one computer to another, you can take the modem along with you. However, an external modem costs more than an internal one—somewhere in the neighborhood of $100 more—even if you buy through a mail order house.

Voice/Data Jacks

As we mentioned before, many direct connect modems (internal and external) include two modular phone jacks—one for data transmissions and one for a voice line. The smarter modems automatically switch between the two, although most change with the flick of a switch.

Self Test

Many modems perform a self test. A pattern generator and error checking circuitry verify the ability to send and receive data. The three tests are analog loop back, digital loop back, and remote digital loop back.

In the analog loop back test, data are sent from the pattern generator

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INVESTEXT Research Reports
Management Contents Publication Abstracts
Employment Services
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Commodity World News
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A-Z Worldwide Hotel Guide
Travel, Hotel Tickets & Reservations
Restaurant Guides
Travel Tips, Tours

SHOPPING & LEISURE
Movie Reviews
Comp-u-store Electronic Shopping
Games, Educational Quizzes

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Modem Comparison Chart...

Manufacturer	Model	Price	Type	Installation	Speed	Bundled Software
Codex 20 Cabot Blvd. Mansfield, MA 02048 (617) 364-2000	5103 5212/ACU	$425 $645	DC DC	External External	300 1200/300	- -
Comdata Corp. 7900 N. Nagle Ave. Morton Grove, IL 60053 (312) 470-9600	212E2-32	$237	DC	External	1200	-
Commodore 1200 Wilson Dr. West Chester, PA 19380 (215) 431-9100	1670 VicModem AutoVic 1660	N/A $99.95 $149.95 $129.95	 DC DC DC	External External External External	1200/300 300 300 300	- - AutoTerm -
Concord Data Systems 303 Bear Hill Rd. Waltham, MA 02154 (617) 890-1394	CDS 224 ARQ Superduplex	$1295 $1695	DC DC	External External	2400/1200 2400/1200	- -
CTS Datacomm Products 400 Reiman Ave. Sandwich, IL 60548 (815) 786-8411	CTS OE-1 (for Osborne Executive)	$135	DC	External	300	Myterm
Datasolvers Inc. 440 Maple Wichita, KS 67213 (316) 264-5068	DS 1200 SMT	$427.50	DC	Internal (Kaypro)	1200/300	SModem
Datec Inc. 200 Eastowne Dr. Chapel Hill, NC 27514 (919) 929-2135	30 33 Pal 212 Pal Plus	$225 $219 $497 $595	AC DC DC DC	External External External Internal (IBM)	300 300 1200/300 1200/300	- - - Crosstalk
Develcon Electronics 744 Nina Way Warminster, PA 18974 (215) 443-5450	6212 7212 8212	$495 $575 $650	DC DC DC	External External External	1200 1200/300 1200/300	No No No
Gandalf Data Inc. 1019 S. Noel Wheeling, IL 60090 (312) 541-6060	SAM 224 SAM 212A SAM 201 LDM 408/418	$795 $618 $725 $795/895	DC DC DC DC	External External External External	2400/1200/300 1200/300 2400/1200/300 4800	- - - -
General DataComm Middlebury, CT 06762 (203) 574-1118	GDC 1200 GDC 300	$499 N/A	DC DC	External External	1200/300 300	- -
General Electric Consumer Electronics Div. Syracuse NY 13221 (800) 626-2000	3-8200	$119.95	DC/ AC	External	300	-
Hayes Microcomputer Products 5923 Peachtree Industrial Blvd. Norcross, GA 30092 (404) 449-8791	Smartmodem 300 Smartmodem 1200 Smartmodem 1200B Smartmodem 2400 Micromodem IIe Micromodem 100	$289 $699 $599 $899 $289 $399	DC DC DC DC DC DC	External External Internal (IBM) External Internal(Apple) Internal	300 1200/300 1200/300 2400/1200/300 300 300	Smartcom Smartcom Smartcom Smartcom Smartcom Smartcom
IBM P.O. Box 1328 Boca Raton, FL 33432 (800) 447-4700	PCjr Internal Modem	$199	DC	Internal (IBM PCjr)	300	-
Incomm Data Systems 115 N. Wolf Rd. Wheeling, IL 60090 (312) 459-8881	2400 FDX EC 212A ER 212A PC 1200	$899 $499 $599 $499	DC DC DC DC	External External Ext or Int Internal	2400/1200 1200/300 1200/300 1200/300	- - - -

through the transmitter. The receiver routes the data into the error checking circuitry, which compares them with the original data and flags any errors.

The digital loop back test allows you to test another modem. Data are sent from your modem to the receiver of the other modem, through the transmitter, and back to the error checking circuitry in your modem. Note that the digital loop back test requires the help of a person to tend the other modem. The remote digital loop back test is the same as the digital loop back test, but needs no additional person at the other end.

Duplex

Half duplex, or one-way communication, has generally been superceded by full duplex, or two-way communication. Unless you you need a modem for specialized use that requires only half duplex operation, stick to full duplex.

Automatic Response

Auto dial/auto answer are two of the more popular modem features. With the old acoustic modems, you had to dial the number by hand. Newer, smarter modems allow you to dial numbers through the software from the keyboard. The modem mimics the tones of the phone to call out. Likewise, the modem can automatically answer the phone, recognizing the tones and beginning appropriate procedures.

Software

Many modem manufacturers bundle software with their modems. For an overview of packages available separately, see the February 1985 issue in which we reviewed 17 telecommunications software packages. Unfortunately, three of the real heavyweights were absent—Hayes *Smartcom II*, US Robotics *Telpac*, and IBM *Personal Communications Manager*.

Smartcom II is the choice of many Hayes Smartmodem and Smartmodem-compatible users. It allows for easy changes in baud rate, bit patterns, and most other modem functions. It provides a directory for storing numbers and log-in procedures that are available at the touch of the button. It requires 96K to run, and retails for $119. Versions are available for many popular computers.

Telpac is compatible with many popular computers, including the IBM PC and compatibles, Apple II, and computers running CP/M. It supports many modems, including Multi-Tech, Novation, Anchor, Prentice, Hayes,

Ven-Tel, Prometheus, and of course, US Robotics. It includes terminal emulation (VT 52/100, Televideo 910, and TTY ASCII), and the latest version includes windowing and instant access to menus. It requires 192K (256K suggested) and retails for $99.

Personal Communications Manager is the official IBM communications package for the PCjr. It stores telephone numbers and log-on procedures, transmits and receives files, and keeps track of how long you have been on line. It also includes a handy electronic mail function and the ability to program function keys. *Personal Communications Manager* requires 128K and sells for $100.

If software is not bundled with the modem you buy, you must purchase it. You absolutely need telecommunications software to run a modem. IBM PC owners can probably find a copy of *PC Talk III* at a local user's group. *PC Talk III* is called freeware, which means you are encouraged to copy and pass out the software. Not only does it carry an attractive "price," but it is a good telecommunications program.

The two types of programs generally available are menu-driven and command-driven. Menu-driven software (like Hayes *Smartcom II*) is easier to learn, but takes longer to use. Command-driven software (like Microstuf *Crosstalk XVI*) is harder to learn, but faster to use once learned. Features to look for include selectable baud rate, selectable bit patterns, directory, automatic log-on procedures, file transfer prompts, automatic redial, and help menus.

The Mainframe Connection

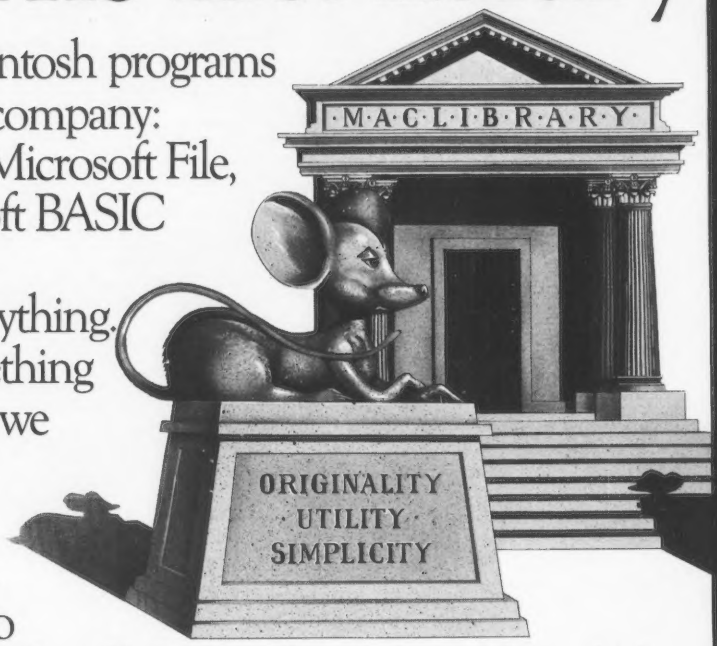
Right now, 2400 baud seems to be the "state-of-the-art" speed for microcomputer modems, with 4800 baud and 9600 baud looming on the horizon. Yet telecommunications within networks and between mainframes exceeded that speed long ago. These sophisticated (and expensive) modems shoot between 9600 and 19,200 bits per second down the line—using the same RS-232C port found on your computer.

You can gain the speed benefits of these sophisticated modems if you are willing to bear the cost of the modem and the cost of leasing a dedicated telephone line. The basic level of quality you can expect is termed 3002. Better quality lines are rated C-1, C-2, and so on. Higher speeds increase the probability of transmission errors, so anything less than a leased line is data suicide.

Modem Comparison Chart...

Manufacturer	Model	Price	Type	Installation	Speed	Bundled Software
International Data 7 Wellington Rd. Lincoln, RI 02865 (401) 333-6200	Model 6220 Model 6240 (Limited distance)	$300 $400	DC DC	External External	9600/4800/2400 9600/4800/2400	- -
Lane Telecommunications 7050 Port West Houston, TX 77024 (713) 862-7200	Lane IBCM Lane IBCM	$825 $625	DC DC	External Internal (IBM PC)	300 300	- -
Lockheed-Getex 1100 Circle 75 Pkwy. Atlanta, GA 30339 (404) 951-0878	GTX 100 Secure modem Data Sentry Model 2000	$995 $995	DC DC	External External	1200/300 1200/300	Yes -
Micom Systems Inc. 20151 Nordhoff St. Chatsworth, CA 91311 (818) 998-8844	DialNet 3024+ DialNet 3024 DialNet 3012+ DialNet 3012	$895 $795 $595 $495	DC DC DC DC	External External External External	2400/1200 2400/1200 1200/300 1200/300	- - - -
Microcom Inc. 1400A Providence Hwy. Norwood, MA 02062 (617) 762-9310	MacModem 1200 MacModem 2400 PC/2400 Era 2 Apple IIe Era 2 IBM PC Era 2 PCjr	$599 $899 $799 $499 $499 $499	DC DC DC DC DC DC	External External Ext or Int Internal Internal (IBM) Internal (PCjr)	1200/300 2400 2400/1200/300 1200/300 1200/300 1200/300	MacModem MacModem Era 2 Era 2 Era 2 Era 2
Microperipheral Corp. 2565 152nd Ave. NE Redmond, WA 98052 (206) 881-7544	Model APV (C64) Model APA (Atari)	$179.95 $179.95	DC DC	External External	300 300	APTerm 64 APTerm
Microplex Inc. 1977 State College Blvd. Anaheim, CA 92806 (714) 634-1535	Versacom 300 Versacom 212	$119 $439	DC	Internal External	300 1200	- -
Multi-Tech Systems Inc. 82 Second Ave. SE New Brighton, MN 55112 (612) 631-3550	MultiModem MultiModem PC MultiModem 224	$549 $499 $795	DC DC DC	External Internal (IBM PC) External	1200/300 1200/300 2400/1200/300	- MultiCom -
Mura Corp. 385 W. John St. Hicksville, NY 11801 (516) 935-4888	MM-100	$69.95	DC	External	300	-
NCR Corp. 1700 S. Patterson Blvd. Dayton, OH 45479 (513) 445-5000	1200 PC	$530		Ext or Int	1200/300	Crosstalk
NEC America Inc. 1012 Steward Dr. Sunnyvale, CA 94086 (408) 737-7711	N 1230 212 AR DSP 2420	$450 $695 $950	DC DC DC	External External External	1200 1200/300 2400/1200/300	- - -
Novation Inc. Box 2875 20409 Prairie St. Chatsworth, CA 91311 (800) 423-5419 (818) 996-5060	Smart-Cat Plus Apple-Cat II Access 1-2-3 212 Apple Cat J-Cat 212 Auto Cat	$499 $595 $595 $319 $149 $695	DC DC DC DC DC DC	Ext or Int Internal Internal (IBM) Internal (Apple) External External	1200/300 1200/300 1200/300 1200/300 300 1200/300	Mite Comware Crosstalk Comware - -
OmniTel 3090 Oakmead Village Dr. Santa Clara, CA 95051 (408) 986-8236	Encore 1200 Encore 1200A/B Encore 300 Encore 300A/B	$499 $399 $289 $269	DC DC DC DC	External Internal External Internal	1200/300 1200/300 300 300	Crosstalk Crosstalk Crosstalk Crosstalk
Panasonic One Panasonic Way Secaucus, NJ 07094 (201) 348-7000	KX-D4130 KX-D401 KX-D402	$199.95 $99.95 $299.95	DC DC DC	External (phone-modem) External External	300 300 1200/300	- - -

The first library



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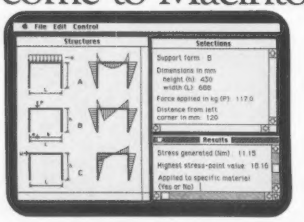

Logo by Logo Computer Systems Inc.

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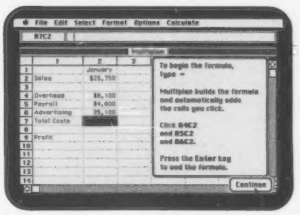

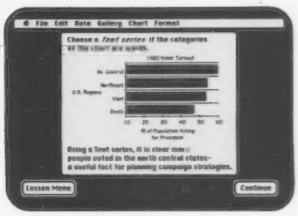

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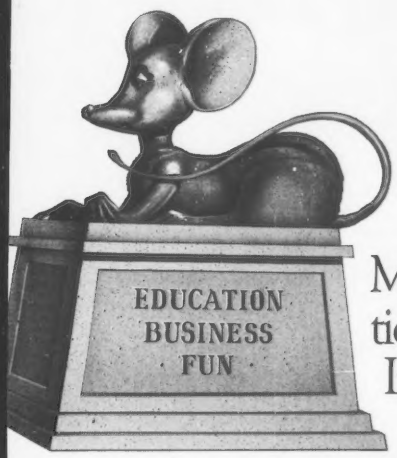

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- Is the shift from 300 to 1200 bps going to repeat itself at 2400 bps? The answer is both yes and no. There certainly are applications for 2400 bps asynch dial-up modems, but we shouldn't expect 1200 bps to die overnight.
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- The MultiModem224 is available in both desktop and IBM PC™ internal card versions. (There is also a rack-mounted version for central sites.) And as a bonus, we provide free offers from ten of the most popular on-line information services, including CompuServe™, Dow Jones™ and The Source.™
- A 2400/1200/300 bps modem is just a plain good investment. Why not let the MultiModem224 provide your communications for both today and tomorrow?

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MultiTech Systems

MultiModem 224

2400/1200/300 BPS Intelligent Modem

Telecommunication Tolls

Hardware and software prices fluctuate dramatically. Usually, the trend is downward. A quick look through the advertisements of mail order houses confirms that many 300 baud modems (which do an admirable job of accessing telecommunications services) cost under $100. Add the cost of a cable (roughly $25) and you are ready to access the world.

On the other hand, a feature-packed top-of-the-line modem can cost you several hundred dollars. You must decide what will best meet your needs. For the home, where telecommunication is more a luxury than a necessity, 300 baud is a good starting point—inexpensive and fast enough for occasional use. Businesses and professionals probably need more speed—a 1200/300 baud modem should do the trick. To steal a phrase, they give you the most baud for the buck.

The new 2400 baud modems are lightning fast, but at this time, the scarcity of compatible hardware and acceptable high speed links make this a longer term investment. However, just about all include 1200 and 300 baud capabilities, so if you buy now, you will not have to upgrade in the future. Falling prices, increased sales, and wider service will make 2400 baud modems an attractive investment over the next year.

All this assumes you already own a serial card with an RS-232C serial port. Most multifunction cards and some computers include one as standard equipment. If not, you must purchase and install an expansion card with an RS-232C serial port before you can use a modem.

To use a modem, you must use a telephone line, and that means paying telephone charges just as if you were talking to someone. The usual rules apply: calling during business hours incurs the most expensive tolls, while calling after 11:00 p.m. local time gets you the cheapest rate. Yes, you can put a big dent in your pocketbook by calling all the marvelous bulletin boards and services across the country.

Note that you can use alternate long distance services like MCI and Sprint, but your software and hardware should pause and recognize the second dial tone that sounds when you connect with the network. Otherwise, the modem will begin to transmit the phone number, logon sequence, and other data before you actually enter the network, resulting in a telecommunications tangle.

Fortunately, to limit long distance

Modem Comparison Chart...

Manufacturer	Model	Price	Type	Installation	Speed	Bundled Software
Paradyne 8550 Ulmerton Rd. Largo, FL 33540 (813) 530-2000	HDX-12000 FDX 2400 MPX series VHS series	$3600 $805 $950-3400 $10-13K	DC DC DC DC	External External External External	12000 2400/1200 2400/9600 14.4K-19.2K	- - - -
Penril Data 207 Perry Pkwy. Gaithersburg, MD 20877 (301) 921-8600	AD 300/1200 2024 Datalynx 224	$650 $895 $895	DC DC DC	External External External	1200/300 2400/1200 2400/1200/300	- - -
Prentice Corp. 266 Caspian Dr. Sunnyvale, CA 94088 (408) 734-9810	Popcom C-100 Popcom X-100 212 TCM	$445 $475 $795	DC DC DC	Internal (IBM PC) External Ext or Int	1200/300 1200/300 1200/300	- - -
Prometheus Products Inc. 45277 Fremont Blvd. Fremont, CA 94538 (415) 490-2370	ProModem 1200 ProModem 1200A ProModem 1200B ProModem 1200M	$495 $449 $399 $549	DC DC DC DC	External Internal (Apple) Internal (IBM) Internal (Mac)	1200/300 1200/300 1200/300 1200/300	ProCom - Mite ProComM
Quadram 4355 International Blvd. Norcross, GA 30093 (404) 923-6666	Half Card Integral Standalone	$495 $595 $695	DC DC DC	Internal (IBM) Internal (IBM) External	1200/300 1200/300 1200/300	Quadtalk Quadtalk Quadtalk
Qubie Distributing 4809 Calle Alto Camarillo, CA 93010 (805) 482-9829	212A/1200E PC 212A	$329 $299	DC DC	External Internal (IBM)	1200/300 1200/300	PC Talk PC Talk
Qytel 120 Route 17 N. Paramus, NJ 07652 (201) 599-0380	1200 2400	$695 $1195	DC DC	Ext or Int Ext or Int	1200/300 2400/1200	Crosstalk Crosstalk
Racal-Vadic 1525 McCarthy Blvd. Milpitas, CA 95035 (408) 946-2227	2400PC 2400V Maxwell 300 Maxwell 1200	$795 $795 $295 $495	DC DC DC DC	Internal (IBM) External Ext or Int (IBM) Ext or Int (IBM)	2400/1200/300 2400/1200/300 300 1200/300	George George George George
Tandy Radio Shack Fort Worth, TX 76102 (817) 390-3011	DC 2212 DC Modem II 300 Modem	$399.95 $199.95 $179.95	DC DC DC	External External Internal	1200/300 300 300	- - -
Tecmar Inc. 6225 Cochran Rd. Cleveland, OH 44139 (216) 349-0600	Modem 1200	$500	DC	Internal (IBM PC)	1200/300	Tecmar
Tek-Com Corp. 1887 O'Toole Ave. San Jose, CA 95131 (408) 263-7400	202S 202T ALD series ALDXR	$375 $375 $285 $300	DC DC DC DC	Ext or Int Ext or Int Ext or Int Ext or Int	Bell 202 Bell 202 0-9600 0-9600	- - - -
Teneron Corp. 6700 W. 105th St. Beaverton, OR 97005 (503) 646-1599	TC series T series	$995-1995 $695-1495	DC DC	External External	1200/300 1200/300	- -
Texas Instruments P.O. Box 809063 Dallas, TX 76380 (214) 995-6611	TI Internal	$750	DC	Internal (TI)	1200/300	Yes
Theall Engineering Co. P.O. Box 336 Oxford, PA 19363 (215) 932-3488	Modemphone	$119	DC	External (combo modem/phone)	300	-
Touchbase Design 1447 S. Crest Dr. Los Angeles, CA 90035 (213) 277-1208	Touchbase Modem	$129	DC	Internal (for NEC 8201A and notebook/lap portables)	300	-

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	LIST	CONROY
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A2 Controller Card	$ 100	$ 60
Half Height Drive for IIe	$ 269	$ 195
Half Height Drive for IIc	$ 299	$ 209
RANA, Elite I, 163K, 40 Track	$ 299	$ 199
Elite II, 326K, 80 Track	$ 499	$ 369
Elite Controller	$ 145	$ 79
TEAC, T40 Half Ht. Drive, 163K, Direct	$ 249	$ 169
Controller Card for T40 by ComX	$ 79	$ 45
T80 Half Ht Drive, 326K, Double	$ 399	$ 299
Controller Card for T80 by Teac	$ 85	$ 59

HARD DISKS

QUARK, QC10 for IIc/IIe/III/MAC	$1995	$1595

OTHER HARDWARE

	LIST	CONROY
CCS, 7711 or 7710-A Interface, ea.	$ 115	$ 85
CPS/EASTSIDE, Wild Card II (copier, II+/IIe)	$ 140	$ 99
COMX, 80 Col. + 64K RAM Card (IIe)	$ 199	$ 99
16K RAM Card (II+), 1 yr ltd wty	$ 119	$ 29
HAYES, Mach II/III Joystick (II+/IIe)		CALL
KENSINGTON, System Saver Fan	$ 90	$ 65
KEY TRONIC, KB200 Keyboard	$ 298	$ 188
KOALA, Muppet Keys	$ 80	$ 49
Touch Tablet w/Micro Illustrator (IIe/IIc)	$ 125	$ 75
KRAFT, Joystick (II/II+/IIe)	$ 65	$ 49
Game Paddles (II/II+/IIe)	$ 50	$ 39
MICROSOFT, Z80 Premium Softcard (IIe)	$ 395	$ 275
ORANGE MICRO, Grappler Plus (II+/IIe)	$ 149	$ 99
Serial Grappler	$ 119	$ 79
16K Buffer Board for Grappler Plus	$ 99	$ 59
Buffered Grappler Plus, 16K	$ 239	$ 159
PCPI, Applicard, 6 MHz, 14 features	$ 375	$ 250
RH ELECT., Super Fan II w/surge protector	$ 89	$ 59
TITAN, Accelerator IIe	$ 319	$ 219
128K RAM Card (II+)	$ 269	$ 189
TRACKHOUSE, Numeric Key Pad (II+/IIe)	$ 149	$ 94
TG, Select-a-Port	$ 40	$ 26
Joystick or Game Paddles, each	$ 35	$ 22
VIDEX, UltraTerm (II+/IIe)	$ 379	$ 229
VideoTerm 80 Col. Card (II+/IIe)	$ 279	$ 175
PSIO Interface Card	$ 229	$ 145
WICO, Smartcard (spec. II/II+/IIe)	$ 199	$ 159

MACINTOSH

	LIST	CONROY
ASSIMILATION PROC, Turbo Touch	$ 129	$ 92
Mac to Epson Connection	$ 69	$ 39
BLUECHIP, Millionaire, Barron, Tycoon, ea.	$ 50	$ 39
CENTRAL POINT, Copy II Mac or MacTools, ea.	$ 40	$ 24
CONROY-LA POINTE, Diskettes, 10 pak	$ 65	$ 29
50 pak Diskettes	$ 325	$ 140
CONTINENTAL, Home Accountant	$ 100	$ 65
CREATIVE SOLUTIONS, MacForth Level I	$ 149	$ 95
CREIGHTON, Home Pak or Mac Office, ea.	$ 39	$ 26
Mac Spell+	$ 99	$ 66
DESKTOP, 1st Base	$ 195	$ 125
DOW JONES, Market Manager Plus	$ 249	$ 159
EXPERTELLIGENCE, ExperLogo	$ 150	$ 80
FIRST BYTE, Smooth Talker	$ 150	$ 95
FORETHOUGHT, Fact Finder	$ 150	$ 95
HAYDEN, Sargon III	$ 50	$ 31
HUMAN EDGE, Sales or Mgmt Edge, ea	$ 250	$ 159
Mind Prober	$ 50	$ 32
INFOCOM, Hitchhiker's Guide	$ 40	$ 25
INNOVATIVE, Flip-n-File, 40	$ 30	$ 19
KENSINGTON, Disk Case, 36	$ 30	$ 22
KOALA, Mac Vision	$ 400	$ 229
LIVING VIDEOTEXT, Think Tank	$ 145	$ 85
LOTUS, Jazz	$ 595	$ 395
MAIN STREET, Filer or Writer, each	$ 199	$ 125
MEGAHAUS, Megafiler	$ 195	$ 125
Megaworks or Megamerge, each	$ 125	$ 79
MICROSOFT, Business Pak NEW	$ 595	$ 395
Multiplan, Word, or File, each	$ 195	$ 129
MILES, Mac the Knife, v. 1	$ 39	$ 25
MONOGRAM, Dollars & Sense	$ 150	$ 95
NOVATION, Smartcat Plus Modem w/Software	$ 499	$ 349
ODESTA, Helix	$ 395	$ 265
PENGUIN, Graphics Magician	$ 50	$ 32
PROVUE, Overvue	$ 295	$ 185
SIMON & SCHUSTER, Typing Tutor III	$ 50	$ 30
SOFTW. PUBL., PFS: File or Report, ea	$ 125	$ 79
PFS: File & Report Combo	$ 195	$ 125
SOFTWARE ARTS, T/K Solver	$ 249	$ 159
STATE OF THE ART, Electronic Checkbook	$ 80	$ 50
STONEWARE, DB Master	$ 195	$ 125
TELOS, File Vision	$ 195	$ 125
WARNER, Desk Organizer	$ 149	$ 99

BUSINESS SOFTWARE

	LIST	CONROY
ALS, Word or List Handler, ea.	$ 80	$ 36
Handler Pak (Word/List/Spell)	$ 170	$ 73
APPLIED SOFT TECH., VersaForm	$ 289	$ 179
ASHTON-TATE, dBase II (Reg CP/M 80)	$ 495	$ 269
BPI, Job Cost	$ 595	$ 365
AR, AP, PR or INV, each	$ 395	$ 240
BRODERBUND, Print Shop	$ 50	$ 29
Print Shop Graphics Library	$ 25	$ 18
Bank St. Writer or Speller, ea (specify II+/IIe/IIc)	$ 70	$ 45
Bank St. Combo (Writer & Speller)	$ 140	$ 85
CONTINENTAL, GL, AR, AP or PR, ea.	$ 250	$ 150
CDEX, for Visicalc, Multiplan, Apple IIe, ea.	$ 60	$ 40
DOW JONES, Market Manager Plus	$ 249	$ 159
Market Analyzer or Microscope, ea.	$ 349	$ 219
HAYDEN, Pie Writer (v2.2)	$ 150	$ 100
HOWARD SOFT, Tax Preparer for '84 taxes	$ 250	$ 165
Kit for California	$ 95	$ 63
HUMAN EDGE, Sales or Mgmt Edge, ea.	$ 250	$ 165
LIVING VIDEOTEXT, Think Tank	$ 145	$ 89
MECA, Managing Your Money	$ 200	$ 125
MEGAHAUS, Megawriter	$ 100	$ 65
Megaworks	$ 125	$ 75
MICRO PRO, WordStar	$ 350	$ 189
WordStar w/ Starcard	$ 495	$ 265
WordStar Professional, 4 Pak	$ 495	$ 265
MailMerge, SpellStar, or StarIndex, ea	$ 99	$ 54
InfoStar and StarCard Combo	$ 595	$ 295
MICROSOFT,		
Multi-Plan (Ap DOS)	$ 95	$ 62
QUARK, Word Juggler & Lexicheck (IIe/IIc)	$ 149	$ 125
SENSIBLE, Sensible Speller	$ 125	$ 79
SIERRA/ON-LINE, Homeword	$ 50	$ 45
General Manager II	$ 230	$ 155
Screen Writer II, 2 Pak w/Dictionary	$ 130	$ 89
SOFTWARE PUBL, (specify II+ or IIe for all)		
PFS:File or Write, each	$ 125	$ 79
PFS:Graph or Report, each	$ 125	$ 79
STONEWARE, DB Master, v. 4	$ 350	$ 225
DB Utility Pak I or II, each	$ 129	$ 82

UTILITIES SOFTWARE

	LIST	CONROY
BEAGLE, GPLE, Alpha Plot or B.Basic, ea	$ 50	$ 27
Pronto DOS, Disk Quick, Ap. Mech. or I.O. Silver, ea	$ 30	$ 19
Full line IN STOCK		CALL
BORLAND, Turbo Pascal	$ 55	$ 33
3 Pak (Pas. Turbo Tut, Toolbox) NEW	$ 105	$ 59
CENTRAL POINT Copy II Plus (bit copier)	$ 40	$ 23
Filer, Utility & Apple DOS 3.3	$ 20	$ 15

UTILITIES SOFTWARE

	LIST PRICE	CONROY PRICE
EINSTEIN/ALISON, Compiler	$ 129	$ 95
EPSON, Graphics Dump	$ 15	$ 7
FUNK, Sideways	$ 60	$ 40
HAYES, Terminal Prog. for Smartmodem	$ 99	$ 65
MICROSOFT, Full Line in Stock		CALL
OMEGA, Locksmith	$ 100	$ 70
PENGUIN, Complete Graphics System II	$ 80	$ 49
Graphics Magician	$ 60	$ 40
PHOENIX, Zoom Grafix	$ 40	$ 34
QUALITY, Bag of Tricks	$ 40	$ 29
UNITED SWI, ASCII Express-The Pro	$ 130	$ 82
UTILICO, Essential Data Duplicator III	$ 80	$ 49

HOME & EDUCATIONAL

	LIST	CONROY
BEAGLE BROS., Full line IN STOCK		CALL
BRODERBUND, Print Shop	$ 50	$ 29
CONTINENTAL, Home Accountant	$ 75	$ 43
DOW JONES, Home Budget	$ 99	$ 69
KOALA, Full line IN STOCK		CALL
MICROSOFT, Typing Tutor II	$ 25	$ 17
MONOGRAM, Dollars & Sense or S.A.M., ea	$ 100	$ 59
Dollars & Sense for IIc	$ 120	$ 69
SCARBOROUGH, Mastertype	$ 40	$ 27
Your Personal Net Worth	$ 80	$ 50
SIERRA/ON-LINE, Homeword	$ 50	$ 45
SIMON & SCHUSTER, Typing Tutor III	$ 50	$ 33

PLUS: BARRONS, CBS, DAVIDSON, EDU-WARE, HARCOURT, LEARNING CO., TERRAPIN

RECREATIONAL SOFTWARE

	LIST	CONROY
BLUECHIP, Millionaire, Squire, Barron, ea.	$ 50	$ 32
DATASOFT, Aztec or Zaxxon, each	$ 40	$ 27
ELECTRONIC ARTS, Sky Fox	$ 40	$ 29
Pinball or Music Construction, ea.	$ 40	$ 29
HAYDEN, Sargon III (Chess)	$ 50	$ 30
INFOCOM, Zork I, II, or III, ea	$ 40	$ 25
ORIGIN, Ultima III	$ 60	$ 37
PENGUIN, Transylvania	$ 35	$ 24
PROFESSIONAL, Trivia Fever	$ 40	$ 25
SIERRA/ON-LINE, Ultima II	$ 60	$ 37
SIR-TECH, Wizardry	$ 50	$ 30
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	LIST	CONROY
CDC, 10 ea, SS/DD, 40 Trk (Apple, etc)	$ 55	$ 19
100 ea, SS/DD, 40 Trk (Apple, etc)	$ 550	$ 195
DYSAN, 10 ea, SS/DD, (Apple, etc.)	$ 40	$ 27
MAXELL, 10 ea, SS/DD, MD1 (Apple)	$ 55	$ 19
VERBATIM, 10 ea, SS/DD, MD515-01, (Apple)	$ 49	$ 25

DOUBLE-SIDED, DOUBLE DENSITY

	LIST	CONROY
CDC, 10 ea, DS/DD, 40 Trk (IBM, H/P)	$ 75	$ 23
100 ea, DS/DD, 40 Trk (IBM, H/P)	$ 750	$ 295
DYSAN, 10 ea, DS/DD, (IBM, H/P)	$ 69	$ 35
MAXELL, 10 ea, DS/DD, MD2 (IBM)	$ 75	$ 26
VERBATIM, 10 ea, DS/DD, MD34 (IBM)	$ 84	$ 29

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250 ea, DS/DD, 48 Track (IBM, H/P)	$ 229

MODEMS

	LIST	CONROY
ANCHOR, Signalman Mark XII (IBM)	$ 399	$ 259
HAYES, 2400B External Modem (IBM)	$ 999	$ 699
Smartmodem 1200B (IBM)	$ 549	$ 389
Smartcom II Software (IBM)	$ 149	$ 107
Stack Chronograph (RS-232)	$ 249	$ 189
Stack Smartmodem 300 (RS-232)	$ 289	$ 219
Smartmodem 1200 (AP or IBM)	$ 599	$ 429
Micromodem IIe w/Smartcom (AP)	$ 329	$ 239
KENSINGTON, Portable Modem, 300 Baud (MAC)	$ 140	$ 109
NOVATION, J-Cat, 300 Baud Modem	$ 149	$ 104
ACCESS 1-2-3 1200B Modem + Crosstalk (IBM)	$ 595	$ 369
Apple Cat II 300 Baud (AP)	$ 389	$ 219
212 Apple Cat, 1200 Baud (AP)	$ 725	$ 419
SmartCat Plus w/software (MAC)	$ 499	$ 349
PROMETHEUS, 1200 Standalone Modem	$ 495	$ 345
ProModem 1200 w/software (MAC)	$ 549	$ 429
ProModem 1200A (AP)	$ 449	$ 349
ProModem 1200B (IBM)	$ 399	$ 289
QUADRAM, Quadmodem, Internal (IBM)	$ 595	$ 425
Quadmodem, External, (IBM)	$ 695	$ 495
VENTEL, PC Half Card (IBM)	$ 549	$ 389
1200 Plus, External (IBM)	$ 499	$ 429
PC 1200, Internal (IBM)	$ 499	$ 379

MONITORS

	LIST	CONROY
AMDEK, Color 300 Comp/Audio	$ 349	$ 249
Color 500 Comp/VCR/RGB/Audio	$ 525	$ 385
Color 600 Hi Res, RGB/Audio	$ 599	$ 459
Color 700 Ultra Hi Res, RGB	$ 749	$ 549
Color 710 Ultra Hi Res, Phos	$ 799	$ 579
300G, 12" Green	$ 179	$ 129
300A, 12" Amber	$ 199	$ 149
310A, 12" Amber, (IBM)	$ 230	$ 159
PRINCETON, HX-12, Hi Res, RGB	$ 795	$ 495
SR-12, Hi Res, RGB	$ 799	$ 599
Scan Doubler for SR-12	$ 249	$ 179
MAX-12, Amber (monochrome)	$ 249	$ 199
QUADRAM, Amberchrome, 12" Amber	$ 250	$ 165
Quadchrome 12" RGB Color	$ 695	$ 495
Quadchrome II, 14" RGB Color	$ 650	$ 450
Quadscreen 17" 968x512 w/cable, Hi Res	$1995	$1595
ZENITH, ZVM122, 12" Amber	$ 159	$ 95
ZMV123, 12" Green	$ 149	$ 99
ZMV124, 12" Amber	$ 200	$ 139
ZMV135, 12" Color	$ 599	$ 499

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	LIST	CONROY
EPSON, RX80—100 cps/quiet mode/128 typest	$ 269	CALL
RX80+ F/T — fricr or tractor	$ 369	CALL
RX100—100 cps/136 col/pin & fr.	$ 499	CALL
FX80+ — 160 cps/80 col.	$ 569	CALL
FX100+ — 160 cps/136 col.	$ 849	CALL
JX80—Color Printer, 160 cps.	$ 799	CALL
LQ1500—200 cps DQ & 67 cps LQ	$1395	CALL
Tractor Feed for LQ 1500	$ 70	CALL
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Spirit-80 - 80 cps/80 col.	$ 269	$ 219
MT160 - 160 cps/80 col.	$ 798	$ 568
MT180 - 160 cps/132 col.	$1098	$ 778
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2410P - Pacemark/350 cps/para.	$2995	$1975
QUADRAM, Quadjet—Inkjet Color Printer	$ 995	$ 795
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SG15 - 120 cps DQ, 30 cps NLQ, 16K NEW	$ 499	$ 419
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SD15 - 160 cps DQ, 40 cps NLQ, 16K NEW	$ 599	$ 509
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Tri-Data 505 E. Middlefield Rd. Mountain View, CA 94039 (415) 969-3700	Oz Guardian	$750	DC	External	1200/300	-
Universal Data Systems 5000 Bradford Dr. Huntsville, AL 35805 (205) 837-8100	UDS-103 UDS-212A/D UDS-9600	$195 $645 $2650	DC DC DC	External External External	300 1200/300 9600	- - -
US Robotics 8100 McCormick Blvd. Skokie, IL 60076 (312) 733-0497	Courier 2400 Microlink 2400 Password Password 300	$895 $895 $449 $199	DC DC DC DC	External Internal (IBM) External External	2400/1200/300 2400/1200/300 1200/300 300	Telpac Telpac - -
Ven-Tel Inc. 2342 Walsh Ave. Santa Clara, CA 95051 (408) 727-5721	Half Card HP Internal 1200 Plus PC Modem 1200	$549 $425 $499 $499	DC DC DC DC	Internal (IBM) Internal (HP) External Internal (IBM)	1200/300 1200/300 1200/300 1200/300	Crosstalk - - Crosstalk
Visionary Electronics 141 Parker Ave. San Francisco, CA 94118 (415) 751-8811	1200 (includes CMOS RAM and clock)	$795	DC	External	1200/300	-
Votrax Inc. 1394 Rankin Troy, MI 48083 (313) 588-2050	DTMF Modem (analog to digital with speech synth)	$700	DC	External	Any	-
Western Datacom 5083 Market St. Youngstown, OH 44512 (216) 788-6583	Datacomm 212 Worldcom 200 424 Autodial 407 DTMF	$625 $595 $925 $595	DC DC DC DC	External External Internal Internal	1200/300 1200/300 2400/1200/300 adjustable	- - - -
Westridge Communications 6913 Valjean Van Nuys, CA 91406 (818) 997-7758	Model 6420 (C64) Model 2050 (Timex 1000,2608)	$99 $119	DC DC	External (cartridge) External	300 300	AutoCom II -
Wolfdata 187 Billerica Rd. Chelmsford, MA 01824 (617) 250-1500	212 X LAPB 212 X.25	$550 $650	DC DC	Ext or Int Ext or Int	1200/300 1200/300	- -
Xecom Inc. 374 Turquoise St. Milpitas, CA 95035 (408) 943-0313	XE1251 Mosart XE1253 Mosart (w/speech synthesizer)	$495 $545	DC DC	Ext and Int Ext and Int (IBM PC)	1200/300 1200/300	- -
Xtron Computer 19 Rector St. 35th Fl. New York, NY 10006 (212) 344-6583	Mitey Mo (C64)	$99.95	DC	External	300	Mighty Plus
Zebra Systems 78-06 Jamaica Ave. Woodhaven, NY 11421 (212) 296-2386	2050 (Timex)	$119	DC	External	300	-
Zoom Telephonics Inc. 207 South St. Boston, MA 02111 (617) 423-4236	Networker Zoom/Modem IIe	$129 $179	DC DC	Internal (Apple II) External (Apple IIe)	300 300	- -

charges and help prevent transmission errors, most telecommunications services allow access through dedicated telecommunications networks that operate local trunk lines. CompuServe, for example, operates its own network. Tymnet and Telenet, two network giants, serve most of the major services, including CompuServe and The Source.

Unfortunately, these local trunk lines are sometimes not so local. Quite often, especially in remote areas, you still incur charges because the phone number lies outside your local calling range. Also, some services charge you a premium for accessing them through other telecommunications networks. However, all things considered, going through a network is generally less expensive than calling the service direct.

And lest you forget, telecommunications services cost money. They usually charge by the hour at rates from $2 to $300. Before you sign up, ask for information. Most send a packet that extolls the virtues of their service and tells you the rates. For a list of the more popular services, see the sidebar.

The End of the Line

What does the future hold for telecommunications? It is difficult to say, but in "Telecommunications: The Ideal and the Reality" (February 1985 issue), Barry Keating provides a good idea of how the business professional can use a modem to improve work flow.

The possibilities for students are equally impressive. Telecommunications can replace the limitations of the local library with the virtually boundless resources of huge databases. Chances are, if you want to research a particular topic, exhaustive information is already available from one of the many services.

A growing number of people use telecommunications for leisure. You may not be able to snare a local opponent for chess at 10:00 p.m., but you can find someone across the country. Many people find new friends with the same interests through telecommunications. The CB on CompuServe and Chat on The Source are two of the most popular meeting places.

The comparison chart will help you decide which modem is right for you. Armed with the appropriate hardware and software, you too can take advantage of the speed, ease, and convenience of telecommunication to improve productivity, research topics, and just plain relax. And the best part—it is only a phone call away. ■

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Great things often come in small packages. A case in point is our unique 3-pen robot plotter that propels itself over any size paper up to 3 ft. by 3 ft. to produce high quality, multi-color graphics. The Penman robot draws straight lines and circles without any "staircase" effect. It responds to a high level command set, including ASCII characters, which may be printed as small as 1 mm high.

Unlike other plotters, Penman does not restrict you to any particular size or shape of paper. Optical sensors in the robot plotter search for the corner of the paper and Penman produces high quality graphics, referenced to this point.

Penman is perfect for business graphics, signs, charts, schematics and connects to any computer with an RS232C serial interface. Software is available to plot from popular spread-sheet programs, including LOTUS 123.

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Axiom's line of Expansion Interfaces makes it easy to connect any parallel input printer to Commodore, Atari and TI computers.

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ParallAx-AT is compatible with all Atari computers including XL series and the new 65XE model. It is a compact, well proven printer interface and is guaranteed to work with your parallel-input printer.

ParallAx-TI plugs directly into the side of the TI 99/4A computer, eliminating the need for the bulky TI expansion box to connect to a parallel-input printer. All TI 'sidecar' expansion units may be daisy-chained through ParallAx-TI without loss of performance.

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Compaq Deskpro Ve

Which is right for you?

Tom Badgett

The Compaq Deskpro—affectionately called the "Texas AT" in some circles—provides heavy competition for the PC AT. This impressive hunk of iron isn't quite as high tech as the AT with its 80286 processor and 16-bit bus, but the Deskpro's 7 MHz 8086 and options give it good performance that stacks up especially well when the AT is unavailable.

The Deskpro is about a year old, and Compaq says sales are "superb." That wasn't the case in the fall when Compaq's thunder was muted by IBM's AT announcement. It seemed that even those users and dealers who hailed the Deskpro as a welcome addition to the PC compatible stable were wowed by the AT. The Deskpro fell on temporary hard times as the spotlight played on the AT.

Why AT?

There are at least four reasons for this attention. The first three are I, B, M. The fourth reason: the PC AT really is awesome. It is a big, fast, powerful micro with a lot of guts at an impressive price. The AT runs about two-and-a-half times as fast as the PC XT, thanks to its 6 MHz, true 16-bit, 80286 CPU. Hard disk storage can go to 40Mb. An improved keyboard, front panel keylock, up to 3Mb of RAM, and an onboard clock/calendar with battery backup round out the package.

The PC AT is offered in two basic configurations: The Model 68, a 256K floppy-based machine and the Model 99 with 512K, a 20Mb hard disk, and a serial/parallel I/O card. Options available from IBM include: memory expansion cards and chips, an additional 20Mb hard disk, 40-track floppy drive, math co-processor, various communications adapter cards, floor standing enclosure, and a tilt and swivel stand for the display monitor.

Hardware Profile

Name: Compaq Deskpro **Type:** Desktop IBM-compatible computer
CPU: 8086 at 7.1 MHz **RAM:** 128K Standard. As Tested: 640K
Operating System: MS DOS V. 2.11 **Keyboard:** Detached, 83-key, rubber dome
Ports: Graphics/text to amber or green 12" monitor; RGB color; composite color or monochrome; RF modulator output; Centronics parallel printer interface; RS-232 w/clock and calendar (with models 3 and 4)
Display: 320 x 200 and 640 x 200 IBM compatible graphics and text; Green or amber monitor included with all units
Documentation: Quality soft-cover manuals. Good illustrations. Easy to follow
Summary: A fast, quality, PC compatible machine. Easy to use. Competitively priced
Price: Model 1: $2495
Model 2: $2995
Model 3: $4995
Model 4: $7195
As tested with 30Mb drive: $8500
Manufacturer: Compaq Computer Corporation
20333 FM149
Houston, TX 77070
(713) 370-7040

CIRCLE **401** ON READER SERVICE CARD

sus IBM PC AT

Hardware Profile

Name: IBM PC AT **Type:** Desktop computer **CPU:** 80286 at 6 MHz
RAM: 256K standard **Operating System:** PC DOS V. 3.0
Keyboard: Detached 84-key, spring technology. Some keys relocated from standard IBM PC
Ports: Color graphics or monochrome display adapter; Centronics Parallel printer port; RS-232 port on enhanced model
Display: Standard IBM PC color graphics or monochrome adapter; color or monochrome monitor, extra
Documentation: Typical IBM
Summary: A fast, well-designed, state-of-the-art computer. Pleasant to look at; easy to use
Price: Basic unit with 1.2 Mb floppy: $3995
Enhanced (20Mb, 512K, serial port): $5795
Manufacturer: IBM Entry Systems Division
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CIRCLE **402** ON READER SERVICE CARD

Or Deskpro?

The Deskpro specs are equally impressive. Its 16-bit 8086 processor normally runs at just over 7 MHz and executes most CPU-intensive tasks about twice as fast as a standard IBM PC. The Deskpro comes in four basic configurations, each of which can be customized.

The model 1 is the basic unit, with 128K of RAM, a single disk drive, and either a green or amber 12" monitor.

The model 2 adds a second disk drive and 128K of RAM to the basic setup.

The model 3 has a 10Mb fixed disk and a clock/calendar/RS-232 board.

The model 4 adds a 10Mb tape cartridge backup unit and another 384K of RAM to the model 3.

You can expand any of the models to 640K of RAM on the motherboard. Other options include a clock/calendar/RS-232 board (standard on models 3 and 4), tilt-swivel monitor stand, and a 30Mb fixed disk. There are no official Compaq display adapter options because, like the earlier Portable, the Deskpro incorporates both graphics and text displays into the same card. Color attributes are displayed on the green or amber screen as shades of variable intensity. Composite video, RF modulator, and RGB monitor outputs are standard equipment on all Deskpro models. Apparently, any third-party PC or PC/XT expansion card that works properly with the IBM machines will function with the Deskpro, expanding greatly the optional configurations possible with the machine. The Deskpro appears to be completely IBM compatible. All of the software we tried on it ran properly.

"We're more compatible with IBM than IBM," quipped Compaq spokesman Ken Price, apparently referring to compatibility problems some users are having with software and hardware products on the AT. In a few instances, products that don't "follow the rules" explicitly don't always run on the AT.

More Comparisons

Both Compaq and IBM have come up with winning successors to their basic machines. Both originals were winners, too. Some people chose the IBM PC for the name, the larger screen, or the keyboard. Others chose the Compaq for its size, portability, integrated text/graphics display, or keyboard. Similar choices are being made between the AT and the Deskpro.

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Really, they are different machines, aimed at different audiences. The Deskpro is a faster, somewhat more powerful successor to the original Compaq Portable, and thus the PC and XT. The AT is that too, of course, but it also was conceived as a Xenix engine for multiuser and multitasking applications, and as a network server.

System Considerations

The 80286 CPU of the AT can address 16Mb of memory directly and one gigabyte of virtual memory using a built-in memory management capability. The CPU also has a built-in memory protection unit to keep multi-users from interfering with one another.

To make use of the multi-user, multi-tasking abilities of the AT, IBM is depending on Xenix, a licensed derivation of AT&T's Unix distributed by Microsoft. This operating system is a multiuser, multitasking operating system that fully exploits the 80286. Software applications from the Unix world presumably could be brought up on the AT relatively easily. The real question is whether IBM will fully support the AT as a multiuser machine, and whether the user community is committed enough to Xenix to make it fly.

DOS 3.0 is the standard operating system for the AT. It is a patchwork upgrade of DOS 2.x—probably the last practical one without a major rewrite. It uses at least 12K more RAM than DOS 2.1, but it has some useful enhancements that obviously lean toward multiuser and network applications:

- Rudimentary file sharing.
- Block locking to restrict access to whole or portions of a file.
- Background printing that supports path and internal program calls.
- New DOS function calls for improved file management.
- VDISK program that uses RAM disk memory above 1Mb.
- Enhanced GRAPHICS screen dump utility for better printer support.

The 8086 CPU of the Deskpro lacks some of the sizzle of the 80286, but it is no slouch. It is a more powerful companion to the 8088 of the PC and XT. The difference between the two is that the 8088 can handle data in 8-bit chunks, while the 8086 can move things two bytes at a time. It is a true 16-bit processor. Both chips can address up to 1Mb of memory and could operate with a system clock speed of 8 MHz. IBM's PC, however, has a clock speed of 4.77 MHz. The Deskpro 8086 operates at 7.1 MHz. The faster system speed coupled with its ability to move data two bytes wide makes for a quick CPU. It isn't as fast in CPU-intensive operations as the AT, but the difference is small—about 25% according to Compaq. Tests with Basic timing loops and prime number generators support that claim.

Compaq says if both units have math coprocessors the Deskpro is faster than the AT. We didn't have access to the math chips to test that one. The Deskpro is more than twice as fast as the PC XT. A keyboard "soft switch" will slow down the system clock to a fully compatible 4.77 MHz to accommodate software that uses software timing loops or has other requirements for the IBM compatible clock. A front-panel LED glows red in this "common" or slowed down condition. When things are running at full speed, the LED is green.

The AT keyboard is a winner. The large Enter and Shift keys are where they belong and have word labels as well as symbols.

Comparing operations that involve disk I/O is more difficult because of the many configuration variables on the Deskpro, and a slightly slower disk read/write routine in DOS 3.0. DOS 2.11 is standard with the Deskpro, and it has some custom Compaq enhancements to handle the tape backup chores. RAM-resident Microsoft GWBasic also is part of the package. The smaller 10Mb Compaq hard disk is slower than the 20Mb IBM unit with its 40ms access time. However, the Compaq 30Mb unit we tested is as fast or faster.

Keyboards

Computer keyboards always cause a great deal of end user comment. The ones with the AT and the Deskpro are no exception.

The AT keyboard is a winner. The large Enter and Shift keys are where they belong and have word labels as well as symbols. Several keys have been moved, but you probably won't notice the change until you look for the Escape key. It is above the number keypad on the right of the keyboard. Whether this is a curse or a blessing depends on whether you use the Esc key regularly, or merely stumble over it when you mean to press Tab. The most useful change is getting the Prtsc/* key away from the right Shift and Enter keys where you can tap it by mistake and lock up your system. A SysReq key has been added to help future Xenix users choose multitasking modules.

Other keyboard enhancements include status indicators for the Num Lock, Caps Lock, and Scroll Lock keys. The action on the new keyboard is very much the same as the old keyboard with perhaps slightly less spring pressure.

The Deskpro keyboard sticks to the original PC layout, adding LED indicators on Caps Lock and Num Lock keys. The action is drastically different. With the Deskpro, Compaq switched to rubber dome technology, abandoning the controversial double spring, two-level keys of the Portable. To long-term PC and XT users, the Deskpro keyboard will seem impossible at first. It is absolutely quiet, for one thing, and it has a soft—very soft—feel. The difference between the Compaq portable and the Deskpro is less noticeable, and if you are a regular user of the new PCjr keyboard, as I am, you'll feel right at home. The technology is the same, and the feel quite similar. I found that after a few hours on the Deskpro, my typing speed seemed to increase over my old standby Portable.

It is a comfortable keyboard and easy to get used to, but it seems strange that Compaq kept the small Return and Shift keys of the original instead of making the same changes IBM did with the AT. It probably is just another example of Compaq's driving effort to remain IBM compatible. They apparently just didn't know about the AT—or didn't know enough about it—before the Deskpro was released. One user told me he liked the Deskpro better all around, except for the "incredible, cheesy, cheap, toy-like keyboard." He bought an AT because of that one complaint. To each his own.

Disk Drives

The PC AT can have up to three internal disk drives. They can be two floppies and one hard disk or two hard disks and one floppy. The floppy disk drives come in two varieties. The standard is an 80-track, high density unit which can store 1.2Mb on special diskettes or 360K on regular media. Because this drive uses a recording head which is much smaller than that of a 40-track drive, no compatibility is claimed between the old and new drives. The slot

below the high density floppy can hold a 40-track drive to allow reliable data transfer from the AT to other computers equipped with a similar drive. The hard disks are 20Mb units with an average access time of 40 ms.

The Deskpro does IBM one better with four external storage slots. Two 360K, 40-track floppies generally occupy the top two slots. In the model 4, a 10Mb tape backup unit is in the lower left position, and a 10Mb Winchester is in the lower right. With the current popular software and hardware configurations, this seems like a much more flexible arrangement. IBM apparently felt the 1.2Mb floppy would ease some of the backup problems always present with Winchester devices. But the fact is, the disk media are costly, and, for a 20Mb drive, you must still do a lot of disk swapping to get a good backup.

The Deskpro approach maintains complete media compatibility with existing software, while providing an easy backup solution with the 10Mb streaming tape unit. The tape must be formatted once before use. That takes about 16 minutes. After that you can back up an entire 10Mb disk in 20 minutes or less, depending on whether you do a file-by-file backup, or back up everything on the hard drive. Software utilities permit you to display a directory of the backup tape and restore from tape by named files if you wish. Even with all available options installed, the Deskpro has five IBM compatible expansion slots free.

The crisp Compaq video on a 12″ screen is truly a joy to use.

The AT uses the standard IBM PC display adapter card, with two high-resolution, and equally high priced, options available. The Deskpro stays with the excellent quality combination unit of the Portable, but with a 12″ screen in either amber or green. Either display gives excellent quality. And the crisp Compaq video on a 12″ screen is truly a joy to use.

Making a Choice

The tendency is to compare the IBM PC AT head-to-head with the Compaq Deskpro. That is OK, because they stack up well against each other. In reality, however, they are totally different and should be considered that way when comparison shopping. The Deskpro is a bigger, better, faster PC or Compaq Portable, while the AT is a breed apart. It uses so much new technology—and design philosophy—that it is difficult to compare it with the Deskpro or the PC and XT.

Unless you just have to have the latest CPU technology, or multiuser and networking are musts, the AT may be more machine than you and your budget need. The Deskpro, on the other hand, with its easy expandability and relatively low price, makes an excellent choice for the single user office environment. With its 30Mb disk and other options, it could even be preferable to the AT, unless raw processor speed is the driving force behind your decision making. And that seems a narrow approach to computing, at best. ■

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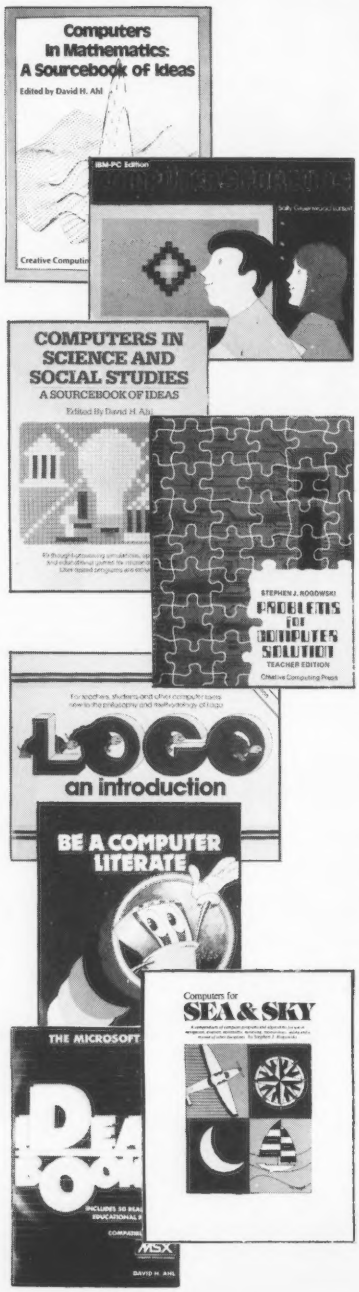

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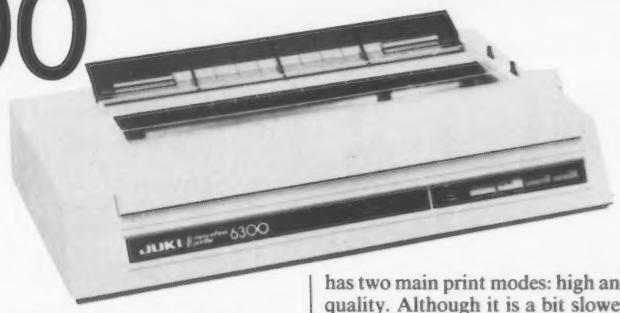

Owen Linzmayer

Sacrifice is essential in the selection of any major purchase, but it is especially true of computer printers. If you buy a dot matrix printer, you sacrifice letter quality output for a variety of easily accessible type modes and dot-addressable graphics. On the other hand, if you purchase a typical daisywheel printer, you get fully-formed characters but sacrifice considerable print speed. Less so today. The Juki 6300 is a $995 daisywheel printer with an impressive output of 40 characters per second (a typical $600 daisywheel prints 15 to 25 cps) and limited graphics capabilities.

The Juki 6300 is a sister model to the popular $599 Juki 6100 printer. Designed to meet the heavier demands of larger businesses, the 6300 zips along at 40 cps and can accept four-part forms up to 16 inches wide.

Physically, the Juki 6300 is a well-built printer that weighs less than 33 pounds. The hinged cover of the 6300 tilts up and pops off to allow access to a bank of DIP switches which control a number of printer options (pica, elite, micro, and proportional pitches). Not only are these switches easy to get to, they are labeled too! A second set of DIP switches used to select one of eight international character sets is located on the back of the unit.

Internally, the 6300 is insulated with foam to reduce operating noise. When printing, the unit emits 60dB, which is very quiet for a daisywheel—it sounds muffled, like a jackhammer being used several blocks down the street. While sitting idle the 6300 is as silent as a church mouse.

Measuring 23.6″ x 15.7″ x 4.9″, the cream-colored Juki 6300 has a footprint slightly larger than an IBM PC. In this world of limited table space, it is a shame that the 6300 doesn't have a slot to accept paper through the bottom of the unit. While we are on the subject, the 6300 uses friction feed to advance paper, though tractor and sheet feeders are available as optional attachments. Unlike many friction feed printers, the 6300 doesn't skew continuous fan-fold paper once it is inserted correctly.

Set up of the 6300 couldn't be less painful. Not only does the User's Manual provide information on connecting the printer to your computer, it also shows you how to use the printer via Basic commands and commercial software packages such as *VisiCalc, WordStar, Multimate, Lotus 1-2-3*, and *AppleWriter II*. This is the kind of attention to detail that is worth paying extra for.

Even though it has only 96 characters on its Diablo printwheel, the Juki 6300 has several different text modes. Selectable through the setting of DIP switches or via software are three pitches that provide from 10 to 15 characters per inch. The manual makes reference to a boldface mode, in which the printer strikes each character twice, but when using a single-strike film ribbon this has no noticeable effect. However, the shadow print mode advances the printhead one horizontal increment and then strikes the second character slightly to the right of the first impression, leaving what I consider a true boldface character.

It should be noted that the Juki 6300 has two main print modes: high and low quality. Although it is a bit slower, the high quality mode offers precise alignment and registration. Frankly, I find the difference between the two negligible, so I usually opt for the quicker low quality mode. The final text output features available through the use of escape sequences are sub- and superscript characters (see sample printout).

In the first paragraph of this review I said that the Juki 6300 has limited graphics capabilities. For those of you who read with disbelief, here is the explanation. As far as the manufacturer is concerned, the fact that the Juki 6300 has precise paper handling (1/96 inch minimum) capabilities allows it to be used to create graphics, presumably with the period character. As far as the typical user is concerned, without the custom software required to use the 6300 in this fashion, you can forget about getting graphics on a daisywheel printer.

The 6300 is designed for small to medium size businesses, and is overkill (i.e., expensive) for home applications. However, if you are looking for a dependable (backed by 90-day warranty) daisywheel printer that is both fast and relatively quiet, an introduction to the Juki 6300 could end your search. Its sleek good looks will get it through the front door, and its impressive personality will make it a welcome member of the family. ■

Hardware Profile

Name: Juki 6300
Type: 96-character daisywheel
Feed: Friction (tractor and sheet feeder optional)
Speed: 40 cps
Interface: Parallel (serial optional)
Graphics: Limited
Character Sets: 7 optional Diablo daisywheels
Buffer: 3K (expandable to 15K)
Logic Seek: Yes, bidirectional
Summary: A quick and quiet daisywheel
Price: $995
Manufacturer: Juki Office Machines Corp.
1261 Wiley Road - Suite B
Schaumburg, IL 60195
(312) 843-3322

```
Juki 6300
Daisywheel
Standard Print
Non-Proportional
 Proportional
Shadow Print
Sub Script
```

Juki Model 6300 sample printout.

Photography by Jeff MacWright.

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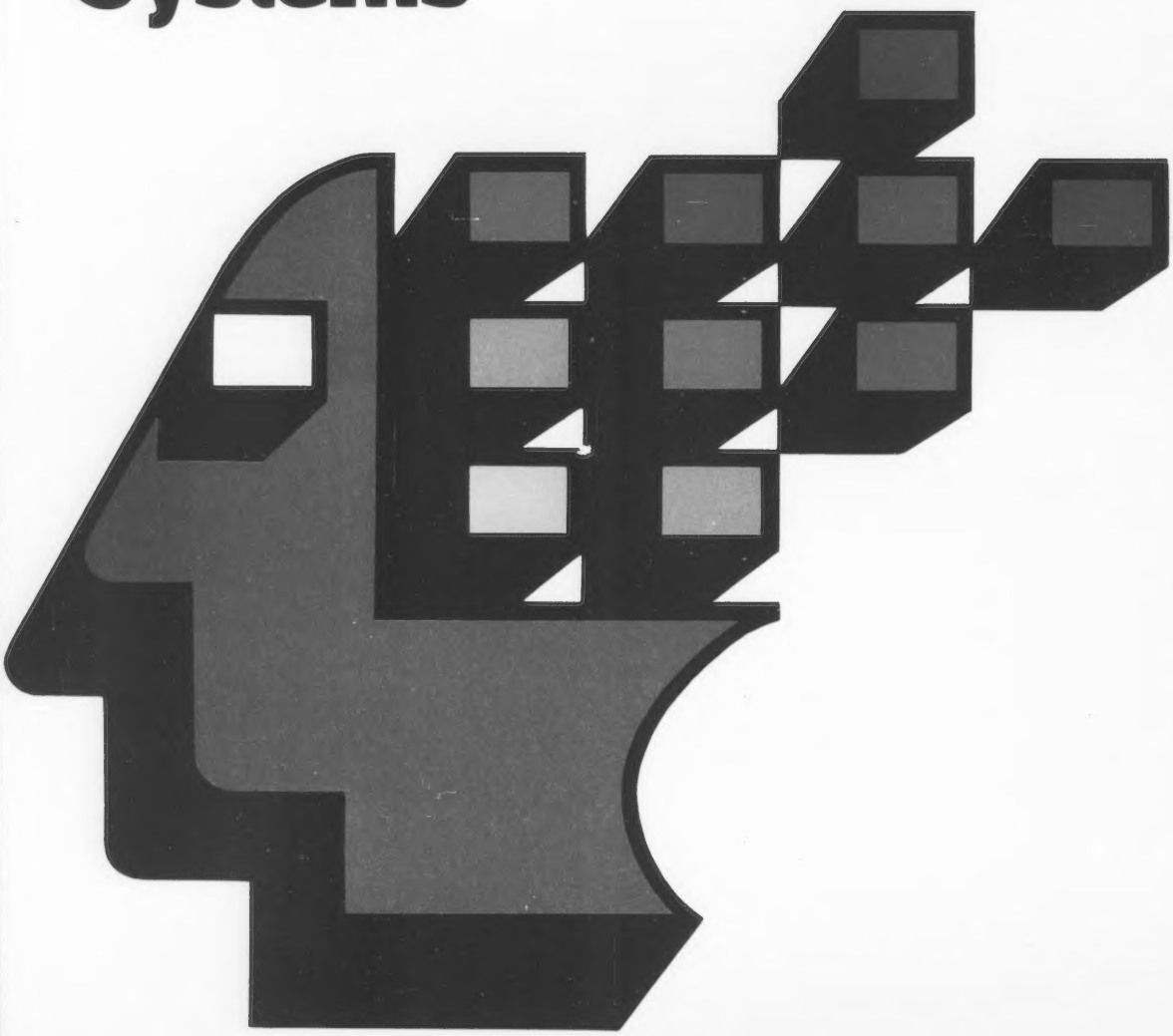

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CIRCLE 122 ON READER SERVICE CARD

Sharp RGB color to go

ISM Express

Russ Lockwood

In the microcomputer market, desktop computers have a distinct advantage over transportable computers: color. Somehow, graphs, charts, and diagrams look better in color. Monochrome graphics, although better than no graphics at all, pale before the power of color.

Most transportable computer manufacturers are farsighted enough to pick a graphics board that allows you to attach a color monitor. Yet when you gain color, you lose transportability.

International Systems Marketing (ISM) offers the Express, a computer that bridges the gap between color and transportability. It packs a 9" RGB monitor and IBM PC compatibility into one neat unit.

Electronic Frankenstein

The ISM sales representative likes to draw a parallel between ISM and IBM. He notes that when IBM sells you a computer, it is really a collection of components from several manufacturers.

When you buy an ISM Express, you are buying Shugart disk drives, a Faraday motherboard with an Intel microprocessor, a Plantronics graphics board, Key Tronic keyboard, and a Sony color monitor. All of these components are solid and dependable and manufactured by name companies in the industry. In a sense, ISM combines top-of-the-line OEM products under one cover.

ISM uses the standard 4.77 MHz 8088 microprocessor, gives you 256K RAM expandable to 640K, and includes five expansion slots for IBM PC compatible expansion boards. Two of the slots are occupied by a color graphics display adapter and a drive controller board. Two half-height floppy drives, or one floppy drive and a hard disk drive (10Mb and 20Mb versions available) provide storage. Room is available to install a third device—floppy, Winchester, or tape backup. Two RS-232 serial ports and one parallel port provide connections to the outside world.

The 9" RGB color monitor in our evaluation unit is actually manufactured by Panasonic. As you might guess, the

Photography by Jeff MacWright.

Hardware Profile

Name: ISM Express **Type:** Transportable business computer
CPU: 16-bit 8088 4.77 MHz **RAM:** 256K (expandable to 640K)
ROM: 8K (expandable to 32K) **Keyboard:** Detachable, 83 keys, slant adjustable
Display: 80 x 25 characters; 320 x 200 pixels (four colors)
Disk drives: Two 360K 5.25" floppy drives or one floppy drive and one 10Mb or 20Mb Winchester
Ports: Two RS-232C serial and one parallel **Dimensions:** 18" x 20" x 8.5"
Weight: 35 lbs. **Operating System:** MS-DOS
Documentation: ISM Technical Reference manual
Summary: A quality IBM PC compatible offers transportability and a superb built-in 9" RGB color monitor with an astounding 0.25mm dot pitch
Price: $3195; with 10Mb Winchester, $4695; with 20Mb Winchester, $4995
Manufacturer: International Systems Marketing
932 Hungerford Dr., Suite 6
Rockville, MD 20850
(301) 279-5775

Table 1. Ahl's Benchmark test.

	Time	Accuracy	Random
IBM PC	24 seconds	0.01159668	6.3
Express	17 seconds	0.00585938	7.2

resolution is very sharp. Take a look at the screen display to see what we mean. Text resolution is 25 lines of 80 characters, and graphics resolution is 320 x 200 pixels in four colors. The optional Plantronics graphics board supplied with our evaluation unit provides 16 colors, making the monitor look even better.

However, ISM is switching monitor manufacturers and will install Sony monitors with an even sharper resolution. Most RGB monitors have a dot pitch of 0.31mm to 0.43mm (see the Buyer's Guide to RGB Monitors in our February 1984 issue for a full explanation of the finer points of RGB monitors). The dot pitch on the Sony monitor is a super sharp 0.25mm.

ISM thoughtfully places the on/off switch on the front of the machine and includes a handy reset switch. The Key Tronic keyboard plugs into the side of the unit rather than the back, increasing keyboard mobility and user comfort.

The Key Tronic keyboard (Model KB5150) corrects several of the shortcomings of the IBM PC keyboard. It features reversed Shift and Backslash keys; English labels instead of arrows on the Backspace, Return, Tab, and Shift keys; raised bumps on the J, F, and 5 keys; LEDs on the Num Lock and Caps Lock keys; a horizontal Return key; and a separate Return key on the numeric keypad. The tactile feedback is good, and the keystrokes are very quiet, eliminating the pronounced clicks of the IBM PC keyboard.

We ran Ahl's Simple Benchmark (see July 1984 issue for a complete explanation) on the Express. The results are shown in Table 1.

Software

In the tradition of IBM PC compatible computer manufacturers, ISM claims the Express is highly compatible with the IBM PC and runs most off-the-shelf PC software. To make a long boast short, ISM is correct.

The de facto standards of IBM PC compatibility are *Lotus 1-2-3* and Microsoft *Flight Simulator*. The Express ran both without a problem. Next, we tried several other packages, from business to education to entertainment. Even the tough, copy protected programs ran perfectly. Give ISM credit; the Express acts like an IBM PC.

Advanced Basic was the only IBM product we could not load and run. Evidently, the Express only accepts GW Basic, the standard Basic bundled with IBM PC compatibles. Some Basic programs written specifically for Advanced Basic may not run using GW Basic.

Thus, we offer our now-standard line regarding compatibles: try the software before you buy the hardware. Based on the *Lotus 1-2-3* and Microsoft *Flight Simulator* tests, we feel confident that the Express will run most software.

Pricing

ISM offers three configurations of the Express. All models include 256K RAM, color monitor, graphics board, built-in serial and parallel ports, and MS-DOS 2.0.

The Express PC, with two 360K double sided, double density floppy drives, retails for $3195. The Express XT-10, with one floppy drive and one 10Mb hard disk drive, sells for $4695. The Express XT-20, with one floppy drive and one 20Mb hard disk drive, retails for $4995.

To Go or to Stay?

ISM manufactures an excellent IBM PC compatible. The Express combines terrific IBM PC compatibility, a sharp RGB color monitor, and several extras like a reset button and an extra serial port in one transportable unit.

Of course, what we have not mentioned yet is the weight. At 35 pounds, the Express is likely to beef up your biceps—if you do not separate your shoulders first. We think the hand strap needs a thicker padding—we like circulation to our fingers as we carry the computer.

All things considered, however, we are enthusiastic about the ISM Express. ISM is too. They are opening a new manufacturing plant (perhaps we should call it an assembly line) to increase production and erase the backlog of orders. If you are an executive or professional looking for transportability, PC compatibility, and the glory of color, take a look at the ISM Express. The color and resolution are sure to impress you. ■

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CIRCLE 104 ON READER SERVICE CARD

The bionic word processor

WordStar 2000 Plus

Russ Lockwood

Imagine the brain trust at MicroPro figuring out how to take Stone Age *WordStar* and transform it into a Space Age word processor. Somehow, it had to revive the aging and ailing program and generate new interest—especially in the corporate and professional sectors.

Of course, we are not privy to the internal goings on at MicroPro, but the result of whatever procedure they used is an impressive, full-featured, state-of-the-art, top-of-the-line word processing system called *WordStar 2000 Plus*. And if the adjectives don't knock you off your feet, the sophistication will.

Countdown to Features

WordStar 2000 Plus includes all the features and functions you expect of a good, solid word processing program: insert, delete, block operations, search and replace, file merge, boldface, underlining, super- and subscripts, justification, centering, adjustable margins, and full cursor movement. However, MicroPro cuts back on the cumbersome Control codes used in *WordStar* in favor of a combination of Control, Alternate, Shift, and Function keys.

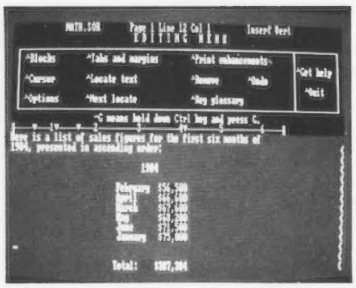
This can be a two-edged sword. New users will be thrilled by the ease of invoking these functions. A plastic template that fits over the keyboard, tear-out quick reference cards, and on-screen menus help you navigate through the program. Extensive, interactive tutorials teach you the system.

Veteran *WordStar* users who have mastered the Control characters will find these new combinations baffling. Some overlap occurs between *WordStar* and *WordStar 2000 Plus*, but not enough to make the transition smooth. To the credit of MicroPro, the commands are more logical to first time users, but not to those of us who load the control codes into "Brain RAM" while *WordStar* loads into "Computer RAM."

WordStar 2000 Plus includes preformatted and user-definable page styles. Default settings include tabs, margins, headers, footers, and more. If you use standardized formats for memos, proposals, and other correspondence, this feature can save you time.

The program also allows macros—single keys defined to print strings of characters. MicroPro finally found out what third-party manufacturers knew all along: these things are handy.

It also offers an Undo command. Many is the time I accidentally pressed Ctrl-Y (delete line) instead of Ctrl-T (delete word). MicroPro eliminates this and other black holes by allowing the most recently erased text to reappear.



Software Profile

Name: WordStar 2000 Plus
Type: Word processing package
System requirements: IBM PC/XT/AT or Compaq with 256K RAM for DOS 2.0/2.1 or 320K for DOS 3.0; two floppy drives or one floppy and one hard disk drive.
Format: Disk
Summary: WordStar went in for reconstructive surgery and emerged as the bionic word processor. It provides just about every feature imaginable. We strongly recommend using a hard disk drive
Price: $595
Manufacturer: MicroPro
33 San Pablo Ave.
San Rafael, CA 94903
(415) 499-1200

More of the Write Stuff

In the Janaury 1985 issue, we reviewed *CorrectStar*, a marvelous spelling checker for *WordStar*. Well, guess what? *WordStar 2000 Plus* includes *CorrectStar* in the package.

WordStar 2000 Plus also does windows. You can move text (including spreadsheet data) among up to three different documents. Furthermore, you can perform arithmetic calculations (add, subtract, multiply, and divide) on that data within the word processing program.

WordStar 2000 Plus also converts document files to ASCII and then transmits them using the telecommunications program TelMerge. Other advanced features include automatic footnoting and indexing, alphabetic and numeric sorting, and a mailing list database with mailmerge functions.

Down to Earth

The biggest drawback is disk accessing and swapping. The installation procedure alone takes approximately 30 minutes of intense disk reading and writing. As you use the program, each feature seems to require accessing or swapping the disk.

At first, MicroPro only allowed three copies to be made. The problem is, once you hit three copies, that's it. That means NO RAM DISKS. Page four of the installation guide specifically warns against RAM disks. Fortunately, cooler heads at MicroPro realized the folly of forcing floppy disk users to install the program into a RAM disk and then uninstall it after each session. Hence, the new version of *WordStar 2000 Plus* is not copy protected. Owners of the old version can request an update kit from dealers.

While *WordStar 2000 Plus* contains a cornucopia of features, the learning curve can be steep.

On the other hand, it is a powerful top-of-the-line word processing system. In fact, I can think of no better pairing than *WordStar 2000 Plus* and an IBM PC AT. Even owners of floppy disk machines can use the program by loading it into a RAM disk.

All in all, *WordStar 2000 Plus* is a welcome step forward in word processing software. MicroPro took *WordStar* and devised a remarkable new product with feature after feature. Executives and professionals: place *WordStar 2000 Plus* at the top of your word processor shopping list. ■

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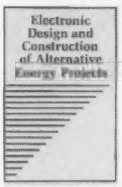

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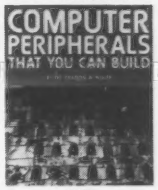

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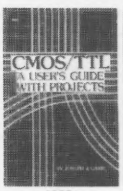

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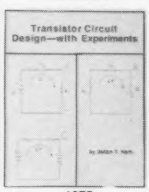

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Microsoft Basic 2.0 for the Mac

Glenn A. Hart

A major obstacle to serious use of Apple's Macintosh computer has been the lack of adequate programming tools. While the "rest of us" for whom Apple tells us the machine is intended may not want to program the Mac, sophisticated Mac owners have been eager to experiment with the wonderful tools hidden inside the enigmatic little computer.

Programmers and systems houses wishing to develop software for the Mac have had to make expensive commitments to this process. The only way to produce Mac products has been to buy a Lisa computer, and costly software, and participate in the Apple development program. Apple has tantalized serious programmers with glimpses of exciting new Basic and Pascal systems, but has not yet released these products.

The only programming language available has been the Version 1 release of a Basic interpreter by Microsoft. Microsoft has written the de facto standard Basic for almost every available microcomputer, including the IBM PC, and Radio Shack, Commodore and other Apple computers, and their involvement with the Macintosh development process has been widely publicized. It was, therefore, reasonable to expect that their Mac Basic would be a worthy product.

Unfortunately, Microsoft's initial Basic was met with more negative reactions than hosannahs. While the language made some use of the special aspects of the Mac user interface, especially a multiple window approach to program entry, editing and execution, it offered only teasing and limited access to the legendary ROM routines that are advertised to make programming the Macintosh a joy. Microsoft Mac Basic Version 1 was far from a *bad* implementation, but it seemed much too much like a quick rehash of the same Basic produced by Microsoft for a slew of other machines. Perhaps it was a case of too great expectations, but the first Microsoft Basic for the Mac simply fell short of what was both expected and hoped for.

Now, many months after the initial release, and with the supposedly innovative Apple Basic *still* not available, Microsoft has released Version 2.0 of their Mac Basic. While cut from the same cloth as the initial release, Version 2 has been very significantly enhanced. Access to the Mac ROM routines is tremendously improved and, equally important, the very nature of Basic has been extended in exciting new directions. In many ways, Microsoft's $160 Mac Basic is now among the most advanced Basic interpreters available on *any* microcomputer.

Mac Basic 2.0 uses multiple windows for program entry and execution.

Mac Basic 2.0 uses multiple windows for program entry and execution. A small Command Window at the bottom of the screen is used to enter commands and immediate mode statements. Program output is displayed in an Output Window, and up to two List Windows can be activated to show program listings. The sizes of the windows, like all normal Mac windows, can be changed.

The Menu Bar choices are greatly expanded over Version 1. The File menu to open, close, save and otherwise manipulate files; Edit menu to cut, paste and copy in the normal Mac fashion; and Control Menu to run, stop, continue, suspend, and list programs and toggle Trace mode are retained from Version 1. But new options like single stepping through a program (executing one Basic statement at a time and halting between each) and printing a file in a special enhanced mode have been added.

Two new Menu choices are available. A comprehensive search/replace mechanism allows finding and, optionally, replacing strings of text, including keywords. This can be a very significant productivity enhancement; some programmers have traditionally used word processors to prepare Microsoft Basic programs just to have searching provisions available. The other new Menu option is Windows, which allows manipulation of the Command, List, and Output windows.

Two versions of the language are provided. One uses BCD (binary coded decimal) math, while the other uses the more common binary floating point math system. BCD offers complete accuracy without the rounding errors endemic to floating point binary math, and is thus much more suitable for business programs where a penny or two rounding error isn't acceptable. BCD math is much slower, however, and the accuracy of floating point is acceptable for many scientific uses, so floating point math is the norm in engineering and like disciplines. The new Basic automatically discerns which interpreter to use when loading a previously saved program. Microsoft is to be commended for providing both alternatives.

The first sample program encountered in the documentation is a shocker—not because of what it does, but because it reveals that something different and new is at hand. The program doesn't have any line numbers, and there are *alphanumeric* line labels here and there. Microsoft Mac Basic 2.0 has finally done away with the slavish adherence to line numbering so scorned by users of other high level languages. The new version will accept programs with line numbers for compatibility, but it obviously prefers programs without them.

The language now uses the standard Geneva typeface rather than the horrible font used in the earlier release. To improve readability further, Basic keywords are now displayed in boldface to make them stand out from user variables and strings.

Programs are entered in a list window. The editor works very much like *MacWrite*, with all the normal mouse methods—cut, paste and copy, etc. Experienced Mac users will feel right at home and be able to enter and edit program text at high speed. Microsoft encourages line indentation to clarify

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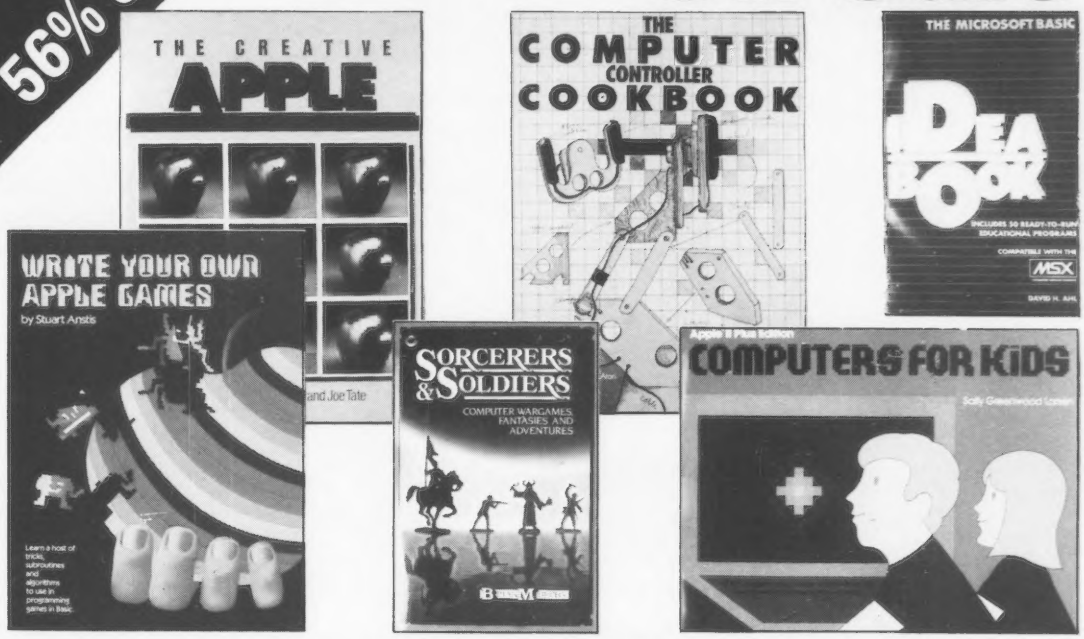

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By David H. Ahl, 5 1/2″ x 8 1/2″, softcover, 144 pages, $8.95.

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Table 1. Changes from Version 1.0.

Statement or Function with Change	Discussion
AUTO Deleted	Used to add line numbers automatically.
BREAK ON/OFF/STOP Added	Enables, disables, or suspends trapping of user attempt to stop program execution.
BUTTON Added	Controls display of option buttons in user-created windows.
CALL Expanded	Dual purpose. Used to call machine language programs as in 1.0. Also calls new Subprograms.
CSRLIN Added	Returns approximate line number of cursor within current output window.
CVDBCD Added	Returns binary math representation of decimal math floating-point number.
DIALOG Added	Monitors when and how user is interacting with buttons, edit fields, and windows.
DIALOG ON/OFF/STOP Added	Enables and disables event trapping based on dialog events.
EDIT Deleted	Displays specified program line number for editing.
EDIT FIELD Added	Creates rectangular area for data entry and allows user entry.
EDIT$ Added	Returns contents of an edit field.
FILE$ Added	Displays standard Mac dialog boxes to allow user to select a file.
LBOUND/UBOUND Added	Returns lower and upper bounds of the dimensions of an array. Useful to determine the size of an array passed to a subprogram.
LOCATE Added	Positions the writing pen at a specified column and line.
MENU Added	Creates custom bar menus and the option choices beneath them.
MENU ON/OFF/STOP Added	Enables, disables, or suspends event trapping based on menu selections.
MKSBCD$/MBDBCD$ Added	Returns a random file buffer string which is a decimal math representation of a binary math floating-point number.
MOUSE ON/OFF/STOP Added	Enables, disables, or suspends event trapping based on pressing of the mouse button.
ON BREAK GOSUB Added	Transfers control to a subroutine when user presses Command-period (Break).
ON DIALOG GOSUB Added	Transfers control to a subroutine when user performs any action affecting a dialog box.
ON MENU GOSUB Added	Transfers control to a subroutine when user selects a menu item.
ON MOUSE GOSUB Added	Transfers control to a subroutine when user presses the mouse button.
ON TIMER GOSUB Added	Transfers control to a subroutine based on a given time interval.
PICTURE Added	Draws a picture stored with PICTURE ON statement.
PICTURE ON/OFF Added	Turns on or off the recording of all screen activity.
PICTURE$ Added	Returns a string containing the entire picture recorded by previous PICTURE ON statement.
RENUM Deleted	Renumbered program lines.
SAVE Expanded	",B" option forces binary file save.
SCROLL Added	Scrolls a defined area vertically or horizontally.
SHARED Added	Defines specified variables within a subprogram common to variables of the same name in the main program.
SOUND Added	Produces a sound; builds and plays a queue of sounds.
SUB/END/SUB/EXIT SUB Added	Starts, ends, and exits a subprogram.
TIMER ON/OFF/STOP Added	Enables, disables, and suspends event trapping based on time.
UCASE$ Added	Returns a string with alpha characters in upper case.
WAVE Added	Defines the shape of a sound wave for a voice and enables or disables multivoice sounds.
WIDTH Expanded	Minor syntax expansions.
WINDOW Added	Creates and closes output windows of various types; can redirect output from the screen to a file.

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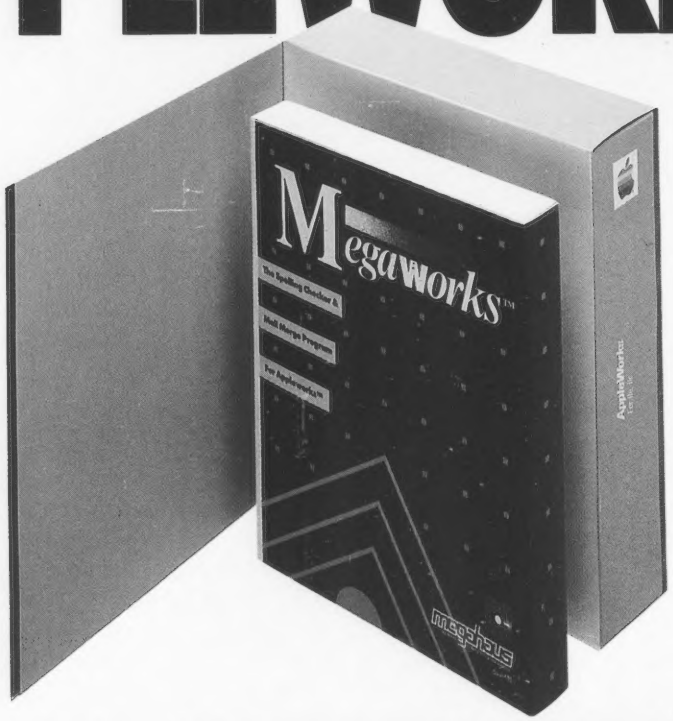

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program flow (a good practice with free-form languages like Pascal, C, and now, Mac Basic), and aids this method by having the editor retain any active indentation when RETURN is hit at the end of a line. Users of UCSD and Turbo Pascal will recognize what a convenience this can be.

Language Syntax

Mac Basic 2.0 is a direct descendant of the Microsoft Basics that have come before. The good points, like flexible string manipulation, as well as the bad aspects, like the convoluted random access disk file methodology, have been retained. Table 1 (page 48) details the changes from the earlier version.

There are obviously too many changes to discuss in detail, but a few broad trends can be discerned easily. Version 2 adds almost complete control of Macintosh interface features like pull-down menus, windows with size bars, use of the mouse, various buttons and dialog boxes, and field editing. About the only things missing are scroll bars on program-created windows. The various commands to control interface-type events are reasonably straightforward, and several excellent examples are provided in the manual and on disk in the form of sample programs.

Programming purists may think the most important aspect of the new language is the subprogram mechanism. Subprograms are *not* like subroutines; they are, rather, much more like procedures or functions in languages like Pascal and C. Parameters passed to the subprogram can be either reference or value, and variables can be local or global. The subprogram scheme is far superior to multi-line functions and adds a new dimenson to the ability to produce and maintain structured code in Basic.

Other significant additions include manipulation of graphic images within Basic, improved control of the Mac sound generating hardware, and a function to convert strings to uppercase. There have, however, been some deletions as well. The language allows programs with line numbers, but the numbers aren't used as they are in other Basics. Line numbers are merely labels; adding a line with a line number does *not* insert the new line. Since line numbers are discouraged, the AUTO and RENUM commands have been eliminated. EDIT has been removed too, because the new method of windowing eliminates the need for an explicit command to edit a line.

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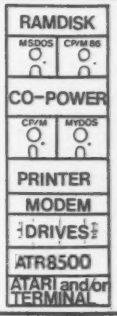

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Performance

Using Version 2 is simple and straightforward. Microsoft has improved the program entry and editing process tremendously in terms of both ease of use and appearance. Making the Basic editor act like *MacWrite* makes the entire product much more intuitive and friendly.

Working without line numbers will seem strange to those whose only language is Basic, but it removes a major annoyance for Pascal and C programmers. Microsoft did not go quite all the way with the anti-line number movement, however. The error trapping and handling routines are still line number oriented. For example, ON ERROR ERL reports only line *numbers*, not labels. Another example of the halfway implementation is that no error trapping is possible in subprograms.

Putting this minor problem aside, the subprogram mechanism is a tremendous advance. Devoted fans of structured programming techniques now have a Basic with much improved control facilities. Perhaps Microsoft could have gone even further (REPEAT UNTIL clauses, for example), but Version 2 is a giant step in the right direction.

Performance was tested with the *Creative Computing* benchmark and the standard 10 iterations of the *Byte* Sieve of Eratosthenes test. Results are shown in Table 2.

Table 2. Benchmark and Sieve test.

	Creative Computing Benchmark			
Version	Time	Accuracy	Random	Sieve Time
MBasic 1	1:35	.0000000458	7.1885600089	18:55
MBasic 2 BCD	1:08	.0000000556	7.1885600089	19:04
MBasic 2 Binary	0:19	.01269531	7.188416	19:01

None of these benchmarks is particularly fast. The tradeoff between the speed and accuracy of binary and BCD math is readily apparent in the simple *Creative* benchmark. The Sieve test uses integer math, which is obviously essentially the same in the various versions. Overall, the interpreter doesn't match a compiler, which is no surprise, but the Microsoft products perform reasonably well.

Documentation is generally rather good, as in most of Microsoft's Macintosh products. Since their manuals for products for other computers are generally mediocre to horrible, the Mac manuals are a real advance. However, there are some problems. A couple of the example programs don't run, and there are a few real clinker mistakes like reversing the order of a statement phrase. Where a statement serves dual purposes, an example is provided for only one usage. Many more examples could be provided for WINDOW, MOUSE, MENU, DIALOG, BUTTON, and the other new statements (see tutorial elsewhere in this issue), and there is practically no discussion of the characteristics of the Mac ROM routines and how to use them effectively.

Given how different Version 2 looks, compatibility with Version 1 is surprisingly good. Assuming that a Version 1 program is saved in straight ASCII text mode (not in compressed binary form), the chances are that it will run with few or no changes under Version 2. Of course, the reverse isn't true; use of any of the advanced features of Version 2 will restrict use to owners of the new release.

This brings up some partially realistic and partially philosophic questions. Microsoft Mac Basic provides excellent access to Macintosh capabilities which were not previously available to the average Mac owner, but what is the purpose? Is this mythical "average Mac owner" a programmer? If so, the new Basic is great, but what is the likelihood of commercial programs that would require the purchaser to have MS Basic 2.0 being distributed? There *have* been examples of decent software distributed in Basic source form (or in the low security "protected" mode), but what is really needed is a true *compiler* if MS Mac Basic is to become a true development language. With the new subprograms and other advanced features, the language could actually be a viable choice for commercial program development—especially if the compiler offered the speed increases seen in Microsoft's other interpreter/compiler families. We can only hold our breath for the compiler version. In the meantime, Version 2 is a valuable addition to the Macintosh software arsenal.

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Point and Click In Microsoft Basic

A Macintosh tutorial

John J. Anderson

This article is aimed at Macintosh owners specifically. But even if you are not a Mac owner, you may find the following tutorial interesting and potentially helpful. The GEM operating system, now available from Digital Research for the MS-DOS operating system, will also be built into ROM on the new 68000-based ST series machines from Atari. GEM creates a desktop environment very similar to that of the Macintosh; it is likely that any strong GEM-tailored Basic will work similarly to Macintosh Basic 2.0—JJA

Ever since you took your Macintosh out of the box, you've loved those pull-down menus, windows, and push-button operations. They make using a computer about as easy and enjoyable as it is likely to become in the foreseeable future. But even as you have grown accustomed to the point-and-click way of life, one peevish disappointment may have nagged at you. Sure, all that magic is addictive. But how to get those wonderful things working in your own programs?

After the initial issue of a rather disappointing Macintosh version of Basic over a year ago, Microsoft Corporation truly has made amends with Mac Microsoft Basic 2.0. This version of the language is at long last deserving of its target machine and is nearly bug-free. It is totally structured, and though line numbers remain an option, there is no need for them. Procedures and sub-procedures can be nested to your heart's desire. And, because this version of Basic offers countless hooks to the Mac Toolbox, pull-down menus, custom windows, dialog boxes, and point-and-click operations can make your Basic programs indistinguishable from professional software products in terms of the user interface.

In this tutorial we'll take a look at how you can harness these features, albeit in a very simple manner. Once you understand the basics unveiled here, you can incorporate these powerful capabilities to make your programs look and act the way they should on a machine of the caliber of the Apple Macintosh: namely, polished.

I should also mention at the outset that for those of you not inclined to type in listings, all the programs that follow are available for download in the Apple Cart section of Creative Computing Online (Compuserve PCS-22).

One more thing before we get to the meat and potatoes. Here are a few guidelines for Basic programming: always skip a line before beginning print in your listings. This will avoid scrunched lines in hard copy due to a bug in the Mac printer driver. Don't ignore the strong editing features of your Macintosh. Cut and paste can save you lots of time when entering repetitive lines of code. Finally, notice that colons are optional between separate commands on a single line. I tend toward including them out of long-term habit, but you can leave them out if you so desire.

Creating a Custom Menu

As I mentioned long ago in my initial review of the Mac, point-and-click is not just a gimmick; it is a powerful approach to computer use. However, without its slick user interface, the Macintosh is just another computer. Unfortunately, some programming languages for the Mac manage to reduce it to that lackluster category, by making it quite difficult for all but the most expert programmer to get the Macintosh Toolbox working. Microsoft Basic 2.0 has changed that. Listing 1 throws a customized menu up onto the ruler in a mere 22 lines.

Listing 1.

```
Beginner's example of MENU control.

MENU 1,0,0,"": ' turn off menu column 1
MENU 2,0,0,"": ' turn off menu column 2

MENU 3,0,1,"Americas": ' this will be column 3 header
MENU 3,1,1,"Argentina": ' then come the items under that header
MENU 3,2,1,"Brazil"
MENU 3,3,1,"Canada"
MENU 3,4,1,"U.S.A"

MENU 4,0,1,"Europe": ' this will be column 4 header
MENU 4,1,1,"Britain"
MENU 4,2,1,"France"
MENU 4,3,1,"Germany"
MENU 4,4,1,"Switzerland"

MENU 5,0,1,"Asia": ' this will be column 5 header
MENU 5,1,1,"China"
MENU 5,2,1,"India"
MENU 5,3,1,"Japan"
MENU 5,4,1,"South Korea"

Idle: ' up ahead we'll see why this has been named as such
  PRINT"Explore menus with mouse...":PRINT:PRINT
  PRINT"Press <RETURN> to exit to Basic"
  INPUT a$: ' gives you a chance to explore menus
  MENU RESET:STOP: ' gives you a chance to break out of menus.
```

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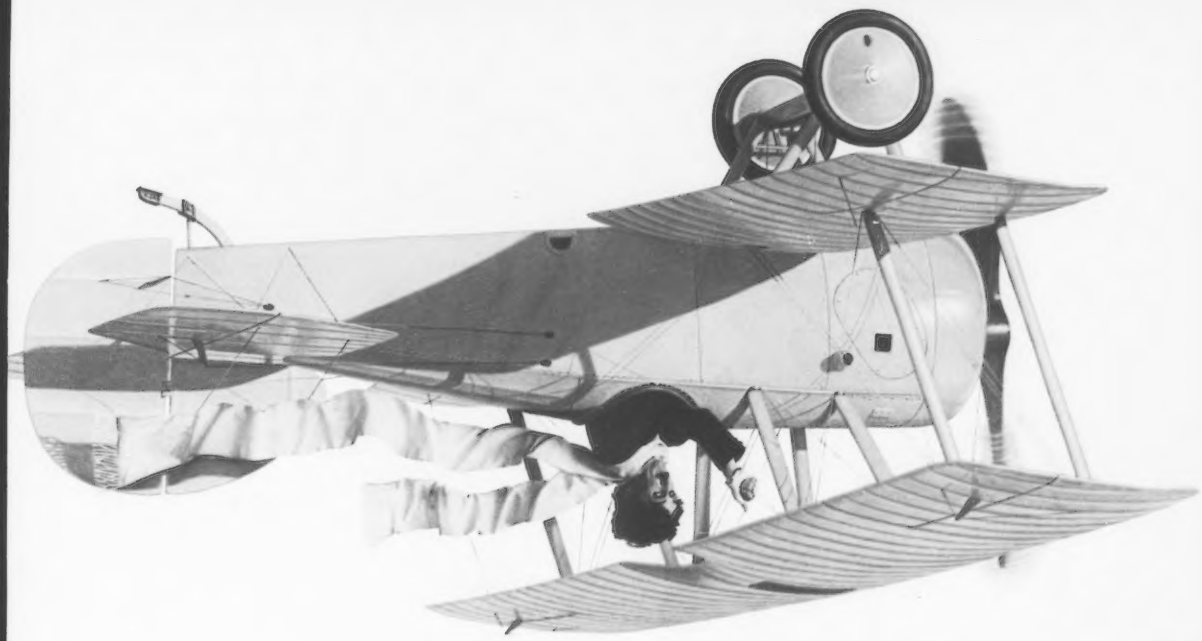

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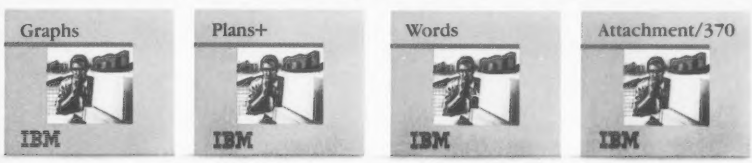

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As you can see, the command MENU is used to get things going. The MENU argument is structured as follows:

```
MENU <menu id, item id,[state, name]> ...where

menu id = the menu header number (range 1-10); you cannot reassign the desk
accessory header

item id = the menu item number (range 0-20); you cannot have more than 20
items on an individual header

state = condition flag (range 0-2); 0 (disable); 1 (enable); 2 (enable with
checkmark)

name = title of the header or item
```

At the top of Listing 1, we first shut off menu columns 1 and 2 entirely. Note that even when there is no title, the quote marks must still appear. We then assign to menu bar slots 3, 4, and 5 the names of continents and countries. Notice that the lead item for each slot is the header, which is then directly followed by its item list set. The item id progresses from 0 to 4 in each case.

From there we move to a procedure called "Idle." Certainly we could have left this bit of code unlabeled, and it would still run—but up ahead we shall see why it merits a name. Within this procedure there are some very recognizable Basic commands. We do some printing, then freeze the action by prompting for keyboard input. When the program is run, you can nose around these menus for as long as you like, until you are convinced that they have been created with lots of help from the Toolbox. Notice that each menu box is perfectly sized to conform with the header and item names. When you click off them, they flash. They await your further instructions. By gaining access to the Toolbox, you can make the 64K of ROM inside the Macintosh work for you.

When you press RETURN, the program calls back the Microsoft Basic menus with the command MENU RESET, and then STOPs. It is imperative that you avoid painting yourself into corners when redefining menus. Once you modify the menu bar, you must provide a way out. Failure to do so results in loops that can be broken only with a flip of the power switch.

Menu-Based Escape Hatch

Listing 2 makes escape from a customized menu an actual selection of that menu. For our purposes that is appropriate, and we will carry that method through in all the programs here, so you can easily move from the actual program to a listing of that program, to see how things work (or don't work). Listing 2 also gives us a first taste of branching from a pull-down menu. The command ON MENU GOSUB launches our simple search. The command MENU ON traps for the ON MENU GOSUB command.

Think of the procedure Idle as a car sitting in neutral, idling. In this case all we want the procedure to do is keep the motor running—hence the procedure loops in an endless GOTO itself. Most programs ultimately hinge off a loop of some kind; if you call such a loop Idle in all your programs it will make them easier to understand.

To follow through with the metaphor, the "transmission" of this program is the procedure Menucheck. We define the variable Itemchoice as the value of MENU(1). Because there is only one header in this chunk of code, we need not count headers at all; we need to count only items of that single header. If MENU(1) returns a value of 1, the selection "Exit to Basic" has been chosen, so we'll GOSUB procedure Breaker. If it returns a value of 2, we'll GOSUB procedure Exitter.

Listing 2.

```
Creating an escape hatch.

MENU 1,0,1,"Stop": 'move loop breaker up onto menu
MENU 1,1,1,"Exit to Basic"
MENU 1,2,1,"Exit to desktop"
MENU 2,0,0,"": ' turn off the rest of the menus
MENU 3,0,0,""
MENU 4,0,0,""
MENU 5,0,0,""

ON MENU GOSUB Menucheck:MENU ON ' search for branching

Idle:
  GOTO Idle: ' all we need here is an endless loop

Menucheck:
  Itemchoice=MENU(1) ' items underneath headers
  ON Itemchoice GOSUB Breaker, Exitter
  MENU Menuchoice,0,1 ' unhighlights menu bar
  RETURN

Breaker:
  MENU RESET
  STOP
  RETURN ' is just here for aesthetics

Exitter:
  SYSTEM
  RETURN ' this too, but always RETURN from GOSUBS
```

The line MENU Menuchoice, 0,1 removes highlighting from the header when it is deselected. Otherwise the highlighting gets stuck in the "on" position. The variable Menuchoice can remain undefined in this listing as it will always be 0; there are no other choices to be had. Further ahead that will no longer be the case.

The procedures Breaker and Exitter are quite straightforward. The former reverts to MS-Basic just as it did in Listing 1. The latter is included for purposes of example, to show how the command SYSTEM closes all open files and returns control to the Finder program. In functional programs, this is a more appropriate escape than that provided by a simple STOP.

Both RETURN statements in these subroutines could be deleted, as the program will never reach them. Still, it is a good idea to get in the habit of returning from all your GOSUBS—a habit that may save you debugging time when writing much more complex code.

Checking Things Out

So far we have branched from menu selections directly to unique subroutines. However, many times a menu selection serves not as a specific branch but rather to modify other menu selections, which is one thing we're out to do here. An indispensible Toolbox tool for this purpose is the check mark. Listing 3 gives us a succinct example of how to get one going.

First we get Breaker installed into menu slot 1. Then we create a menu as we did in the previous example, with one alteration: we put a check mark next to the selection "Rail." Recall that you can do this simply by giving an item a menu state with the value 2. We will default to the item "Rail," while affording the user the opportunity to move the check mark with a point-and-click. First we'll turn off all the other menus and move through Menucheck and Idle in the now-usual manner.

Note that this time around we define variable Menuchoice as well as Itemchoice. These will allow us to keep track of what

items have been pulled down, even with multiple headers. Menuchoice will keep track of headers; Itemchoice will keep track of items.

Depending upon whether the user pulls down "Stop" or "Rail/road," we'll branch to Breaker or Infotype, respectively, by counting through the values of Menuchoice. If "Rail/road" is chosen, we'll branch to procedure Rail or procedure Road, depending on the count through values of Itemchoice. This approach is the foundation of menu-branching. It is quite easy, once you understand it.

Those procedures in our petrie dish example here only move the check mark back and forth. But that check mark moves firm-footedly, doesn't it? It is a simple matter of changing MENU states.

Trains of Thought

Listing 4 is the longest of the programs presented here, as it attempts to show menu control and branching in a meaningful way, along with a few new bells and whistles. Rest assured, however, that it is easy to understand after a few minutes of study. Also, substantial chunks of it make use of modules you have already typed. Use the cut and paste function to grab the menu list from Listing 1. You can also pilfer some of Listing 3, though alterations are needed for a couple of procedures.

Listing 3.

```
Creating and moving a check mark.

MENU 1,0,1,"Stop"
MENU 1,1,1,"Reset"

MENU 2,0,1,"Rail/road": ' column 2 header
MENU 2,1,2,"Rail" ' <2> in last position turns on check mark
MENU 2,2,1,"Road"

MENU 3,0,0,"" ' turn off all these guys
MENU 4,0,0,""
MENU 5,0,0,""

ON MENU GOSUB Menucheck:MENU ON

Idle:
  GOTO Idle

Menucheck:
  Menuchoice=MENU(0)' headers
  Itemchoice=MENU(1)' items underneath headers
  ON Menuchoice GOSUB Breaker, Infotype
  MENU Menuchoice,0,1 ' unhighlights menu bar
  RETURN

Breaker:
  MENU RESET
  STOP
  RETURN

Infotype:
  ON Itemchoice GOSUB Rail, Road
  RETURN

Rail:
  MENU 2,1,2: ' move check mark to item "Rail"
  MENU 2,2,1: ' unmove check mark from item "Road"
  RETURN

Road:
  MENU 2,2,2: ' move check mark to item "Road"
  MENU 2,1,1: ' unmove check mark from item "Rail"
  RETURN
```

(Downloaders need only capture the file.)

This may seem like a strange moment for me to tell you a little something about myself, but you should be forewarned: I am a devotee of railroads of the world. So it seemed natural that our example should deal with that topic. If you are into trains too, so much the better. If you are not, let me underscore that the objective here is to show you how to access the Toolbox through MS-Basic. I'm sure you can easily substitute your own interests for mine.

The top of Listing 4 should look quite familiar to you now. Nothing up the sleeves there. Your first question ought to come in at the WINDOW command. Rather than sending the output to the default window, we use the command to create our own. Format for the WINDOW command is as follows:

```
WINDOW <window id[,[title][,[dimensions][,type]]]> ...where

window id = identifies window (range 1-4); maximum of 4 windows

title = an optional text string argument for use with "document" windows

dimensions = screen boundaries of created window; consists of x,y coordinates
corresponding to upper left- and lower righthand corners

type = indicates type of window (range 1-4); 1 (document window); 2
(two-line "frame" border); 3 (simple one-line border); 4 (window with
shadow)
```

Note that even when a title is omitted, the quote marks must be included, as is the case with MENU. Note also the format for the dimensions of the window, which utilize standard MS-Basic form (parenthesized coordinates separated by a hyphen).

When you are finished with a window, you may or may not need to close it, using a WINDOW CLOSE command. We'll learn more about this up ahead.

As for sizing windows, well, you'll probably need a few trial and error sessions before you get a feel for them. Expect to do some tailoring once you have laid one down. Always make sure any window is big enough to handle the largest of your inputs to it.

Next we encounter the command TEXTFACE. This is very simply a means of calling up character style. Format for the command is:

```
TEXTFACE <attribute> ...where

attribute = 0 (plain text); 1 (bold); 2 (italic); 4 (underlined); 8 (outlined);
16 (shadow); 32 (condensed); 64 (extended)
```

A caveat: the documentation is wrong when it shows a format of CALL TEXTFACE <attribute>. The CALL command means something else entirely, and using it as suggested in the documentation results in a syntax error. This erratum is being redressed by Microsoft.

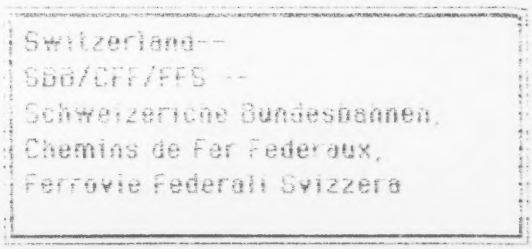
Anyway. We get a better look to the text in our text window by making it boldface. Then we head into our old friend ON MENU GOSUB.

The MENU method then more or less repeats itself. However, in this case there are five possible values for Menuchoice and four Itemchoice possibilities per header. Things get a little crowded, but the technique is no different from what we saw in the preceding modules.

You'll notice an extra statement in the procedures Railnames and Trackage. Here we set up a new variable, rail, to act as a flag. In the following procedures, the value of variable rail determines which text strings are printed. Remember that these are the two menu items that share a checkmark. The user can ask for two types of information from each item on the

Listing 4.

```
MENU control with branching, and a few other neat things.

MENU 1,0,1,"Stop": 'move loop breaker up onto menu
MENU 1,1,1,"Reset"

MENU 2,0,1,"Rail/road"
MENU 2,1,2,"Railname(s)" ' <2> in last position turns on check mark
MENU 2,2,1,"Trackage per 10,000 square miles"

MENU 3,0,1,"Americas"
MENU 3,1,1,"Argentina"
MENU 3,2,1,"Brazil"
MENU 3,3,1,"Canada"
MENU 3,4,1,"U.S.A."

MENU 4,0,1,"Europe"
MENU 4,1,1,"Britain"
MENU 4,2,1,"France"
MENU 4,3,1,"Germany"
MENU 4,4,1,"Switzerland"

MENU 5,0,1,"Asia"
MENU 5,1,1,"China"
MENU 5,2,1,"India"
MENU 5,3,1,"Japan"
MENU 5,4,1,"South Korea"

WINDOW 1, "",(50,50)-(450,150),2: ' Outputs text to a custom window
TEXTFACE 1. ' Puts text into boldface
ON MENU GOSUB Menucheck:MENU ON

Idle:
  GOTO Idle

Menucheck:
  Menuchoice=MENU(0)' headers
  Itemchoice=MENU(1)' items underneath headers
  ON Menuchoice GOSUB Breaker, Infotype, Americas, Europe, Asia
  MENU Menuchoice,0,1
  RETURN

Breaker:
  MENU RESET
  STOP
  RETURN

Infotype:
  ON Itemchoice GOSUB Railnames, Trackage
  RETURN

Americas:
  ON Itemchoice GOSUB Argentina, Brazil, Canada, USA
  RETURN
Europe:
  ON Itemchoice GOSUB Britain, France, Germany, Switzerland
  RETURN
Asia:
  ON Itemchoice GOSUB China, India, Japan, Korea
  RETURN

Railnames:
  rail=0: ' Acts as flag
  MENU 2,1,2:MENU 2,2,1: ' move check mark to item "Railnames"
  RETURN

Trackage:
  rail=1: ' also acts as flag to tell us which set of info to access
  MENU 2,2,2:MENU 2,1,1 ' move check mark to item "Trackage"
  RETURN

Argentina:
  CLS:PRINT "Argentina --": ' Here are the branches for each country
  IF rail=0 THEN PRINT "FA -- Ferrocarriles Argentinos"
  IF rail=1 THEN PRINT "233.3"
  RETURN
Brazil:
  CLS:PRINT "Brazil--"
  IF rail=0 THEN PRINT "RFFSA -- Rede Ferroviaria Federal SA"
  IF rail=1 THEN PRINT "122.6"
  RETURN
Canada:
  CLS:PRINT "Canada--"
  IF rail=0 THEN PRINT "CN -- Canadian National"
  IF rail=1 THEN PRINT "114.8"
  RETURN
USA:
  CLS:PRINT "U.S.A.--"
  IF rail=0 THEN PRINT "There are over 500 railnames in the U.S."
  IF rail=1 THEN PRINT "542.5"
  RETURN
Britain:
  CLS: PRINT"Britain--"
  IF rail=0 THEN PRINT "BR -- British Rail"
  IF rail=1 THEN PRINT "1218.6"
  RETURN
France:
  CLS: PRINT"France--"
  IF rail=0 THEN PRINT "SNCF -- Societe Nationale des Chemins de Fer Francais"
  IF rail=1 THEN PRINT "1035.5"
  RETURN
Germany:
  CLS: PRINT"Germany--"
  IF rail=0 THEN PRINT "DB -- Deutsche Bundesbahn"
  IF rail=1 THEN PRINT "1873.9"
  RETURN
Switzerland:
  CLS:PRINT "Switzerland--"
  IF rail=0 THEN PRINT "SBB/CFF/FFS --"
  IF rail=0 THEN PRINT "Schweizeriche Bundesbahnen,"
  IF rail=0 THEN PRINT "Chemins de Fer Federaux,"
  IF rail=0 THEN PRINT "Ferrovie Federali Svizzera"
  IF rail=1 THEN PRINT "1147.4"
  RETURN
China:
  CLS:PRINT "China--"
  IF rail=0 THEN PRINT "Railways of the People's Republic of China"
  IF rail=1 THEN PRINT "93.1"
  RETURN
India:
  CLS:PRINT "India--"
  IF rail=0 THEN PRINT "IGR -- Indian Government Railways"
  IF rail=1 THEN PRINT "306.6"
  RETURN
Japan:
  CLS:PRINT "Japan--"
  IF rail=0 THEN PRINT "JNR -- Japanese National Railways"
  IF rail=1 THEN PRINT "1168.4"
  RETURN
Korea:
  CLS:PRINT "South Korea--"
  IF rail=0 THEN PRINT "KNR -- Korean National Railroad"
  IF rail=1 THEN PRINT "420.4"
  RETURN
```



Sample output.

menu. Though the approach is somewhat primitive, this is an example of how a checked menu selection can modify other selections. We could use it to control many more than two information states.

The tail end of Listing 4 consists of procedures that print out the information for each country on the menu. As stated, when rail = 0, railway names are printed. When rail = 1, trackage statistics are printed in the window. It's that simple.

When you run the program, notice that you can size, move, or close all the windows on the screen except for the active program window at any time during execution of the program. That's a function of the Toolbox. It is a nice idea here to close them all so that the screen is as neat as possible.

On the Button

Our final program, Listing 5, introduces a new window with pushbuttons in it to help us differentiate between East and West Germany (thought you had me on that, didn't you?). Everything prior to procedure Germany itself should now be clear to you, if you have spent a little time with the previous listings.

Within procedure Germany, we create a new text window in the same manner as before, but lower down on the screen in this case so as not to obscure the original text window. There is a way to recover obscured windows, but that is best left to a future article.

We print a message in the window, then place three buttons there, using the BUTTON command. Format for the command is as follows:

```
BUTTON button id,state[,title,dimensions[,type] ...where

button id = identifies button (range 1 to memory limitations)

state = 0 (button dimmed and inactive); 1 (button active, but not selected); 2
(button active and currently selected)

title = text string description of button function

dimensions = Screen boundaries of created window; consists of x,y coordinates
corresponding to upper left- and righthand corners.

type = indicates type of button (range 1-3); 1 (frame push button); 2 (check
box); 3 ("radio" button)
```

Our use of the button command in Listing 5 is pretty straightforward. Once they have been established, we hold up everything but button-pressing with a WHILE . . . WEND command. The facility of this statement is that it executes a loop as long as a given condition is true. Here we loop until a button is pressed. When one is, we branch to the appropriate subroutine.

In this instance we must close WINDOW 2, to return to normal operation of the program. Hence the statement WINDOW CLOSE 2 appears in all three subroutines—Shut, East, and West.

To add this improvement to Listing 4, copy procedure Germany with its ancillary subroutines, Shut, East, and West, and paste it into Listing 4. Don't forget to then delete the old procedure Germany. (Again, downloaders can capture a complete version of the program from Creative Computing Online.) You will then have a functional Basic program utilizing pull-down menus, windows, and pushbuttons.

That is more than enough for this time around to get you thinking about your own pull-down applications. In a follow-up piece, we'll take a look at reading the mouse and mouse button, pulling up MacPaint files, and the creation of simple graphics and sound in MS-Basic 2.0. Until then, keep on clicking! ■

Listing 5.

```
Creating and reading push buttons.

MENU 1,0,1,"Stop": 'move loop breaker up onto menu
MENU 1,1,1,"Reset"

MENU 2,0,1,"Rail/road": ' column 2 header
MENU 2,1,2,"Railname" ' <2> in last position turns on check mark
MENU 2,2,1,"Trackage per 10,000 square miles"

MENU 3,0,1,"Button Up" ' easy way to get to Germany
MENU 3,1,1,"Germany"
MENU 4,0,0,""
MENU 5,0,0,""

ON MENU GOSUB Menucheck:MENU ON

Idle:
  GOTO Idle

Menucheck:
  Menuchoice=MENU(0)' headers
  Itemchoice=MENU(1)' items underneath headers
  ON Menuchoice GOSUB Breaker, Infotype, Germany
  MENU Menuchoice,0,1' unhighlights menubar
  RETURN

Breaker:
  MENU RESET
  STOP
  RETURN

Infotype:
  ON Itemchoice GOSUB Railnames, Trackage
  RETURN

Railnames:
  MENU 2,1,2:
  MENU 2,2,1:
  rail=0 ' a flag to tell us which type of info to print
  RETURN

Trackage:
  MENU 2,2,2:
  MENU 2,1,1:
  rail=1 ' again, flags what information the user wants
  RETURN

Germany:
  WINDOW 2,"",(100,150)-(330,260),2
  PRINT "Which Germany? Click your choice:"
  BUTTON 1,1,"East Germany",(5,25)-(200,40),1
  BUTTON 2,1,"West Germany",(5,55)-(200,70),1
  BUTTON 3,1,"CANCEL",(5,85)-(200,100),1
    WHILE DIALOG(0)<>1:WEND 'We only want to look at buttons now
    Pressed=DIALOG(1) ' find out which button has been pressed
    IF Pressed=4 THEN GOTO Shut 'cause we're done with the window
    ON Pressed GOSUB East, West

  Shut:
    WINDOW CLOSE 2
    RETURN

  East:
    WINDOW CLOSE 2 ' still need to shut the window even if we've branched

    CLS:PRINT "East Germany--"
    IF rail=0 THEN PRINT"DR -- Deutsche Reichsbahn"
    IF rail=1 THEN PRINT"2152.4"
    RETURN

  West:
    WINDOW CLOSE 2
    CLS:PRINT"West Germany--"
    IF rail=0 THEN PRINT"DB -- Deutsche Bundesbahn"
    IF rail=1 THEN PRINT"1873.9"
    RETURN
```

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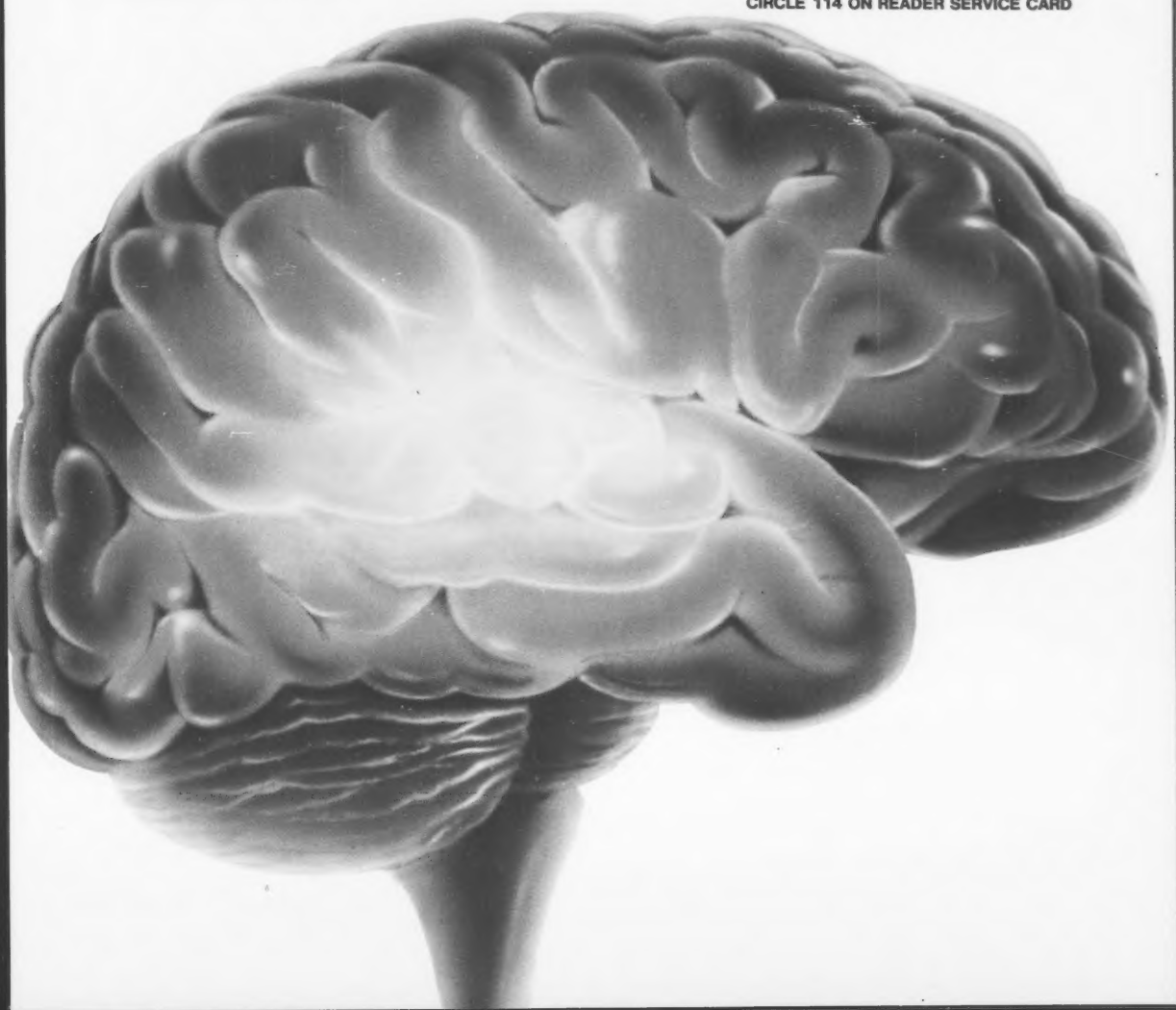
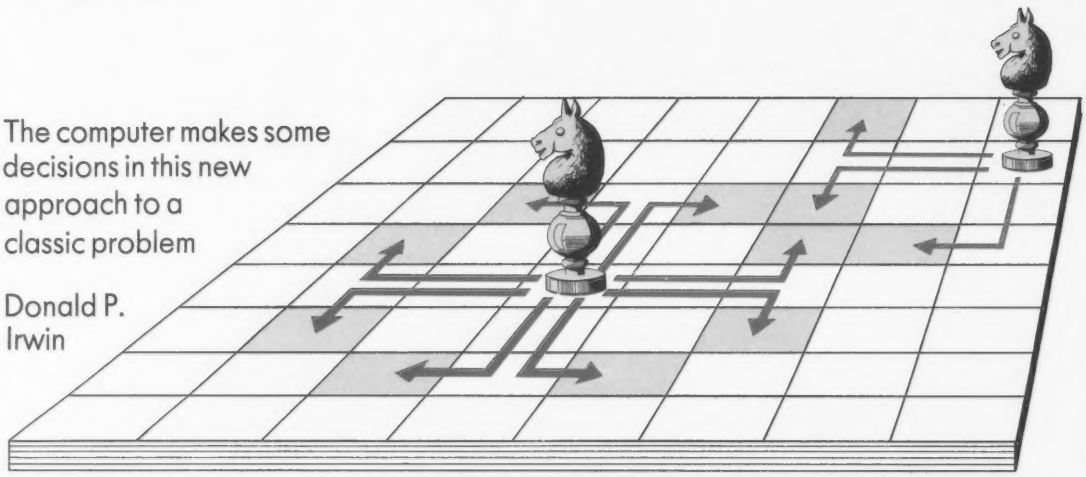


The Knight's Tour

The computer makes some decisions in this new approach to a classic problem

Donald P. Irwin



Through the ages, fascination with the game of chess and its strategic plays has encouraged many types of complicated and analytical puzzles. One of these is the Knight's Tour, which over the past two centuries has interested some of the greatest minds in the fields of both mathematics and game solutions.

The problem involves the placement of a chess knight anywhere on a standard size chessboard, consisting of 64 squares in an 8x8 configuration, then moving the knight from square to square until all 64 squares have been visited once and only once. The legal move for a chess knight is two squares in a vertical or horizontal direction, then one square perpendicular to the previous square (as shown in Figure 1).

Upon being introduced to this puzzle, your first attempt at a solution might consist of placing the knight on the chessboard and arbitrarily moving it about the board. Even if you have some notion of how to move the knight around the board, you'll find that after two or three tries certain problem areas appear. If these problem areas are not eliminated as soon as possible, they may develop into problems that will eventually terminate the knight's tour.

An example of this arbitrary movement method is shown in Figure 2. The knight's itinerary is represented by the numbers 1 to 34 with the letter K representing the knight's present position. The square labelled with the letter C indicates a probable trouble area. A trouble area is a square that has only one entry point and one exit point. If this square is not traversed when the knight lands on any of the adjacent squares, as indicated by the arrows in Figure 2, the square will end up as a termination square. A termination square is one that has only one entry point and no exit square. In the example, squares A and B are terminator squares. Obviously, if more than one of these termination squares is produced in a tour, the tour cannot be completed.

This arbitrary trial and error method will eventually produce a solution to the problem, but only after numerous tries and much backtracking. But because there is no guarantee that the itinerary will be completed from any given point, mathematicians and puzzle enthusiasts alike have tried to find different ways in which a solution could always be reached no matter where the knight starts its path.

Early Approaches

In the early 18th century, people like De Moivre, Euler, Legendre, Roget, Vandermonde, and Warnsdorff devised some very artistic and practical solutions to this fascinating problem. For an interesting array of these solutions, consult W.W.R. Ball's *Mathematical Recreations and Essays* (Macmillan and Company, Ltd., NY, 1905).

Figure 1. Legal moves for the knight from two positions.

In many of the approaches discussed in that book, the author found extravagant solutions to the Knight's Tour. For example, some people were in-

3	13	11	17	B	A	32	19
10	16	4	1		18		30
5	2	14	12		31	20	33
15	9	6			34	29	C
7			K	28		24	21
					22	27	
					25		23
							26

Figure 2. Example of trouble spots: A and B will terminate the tour.

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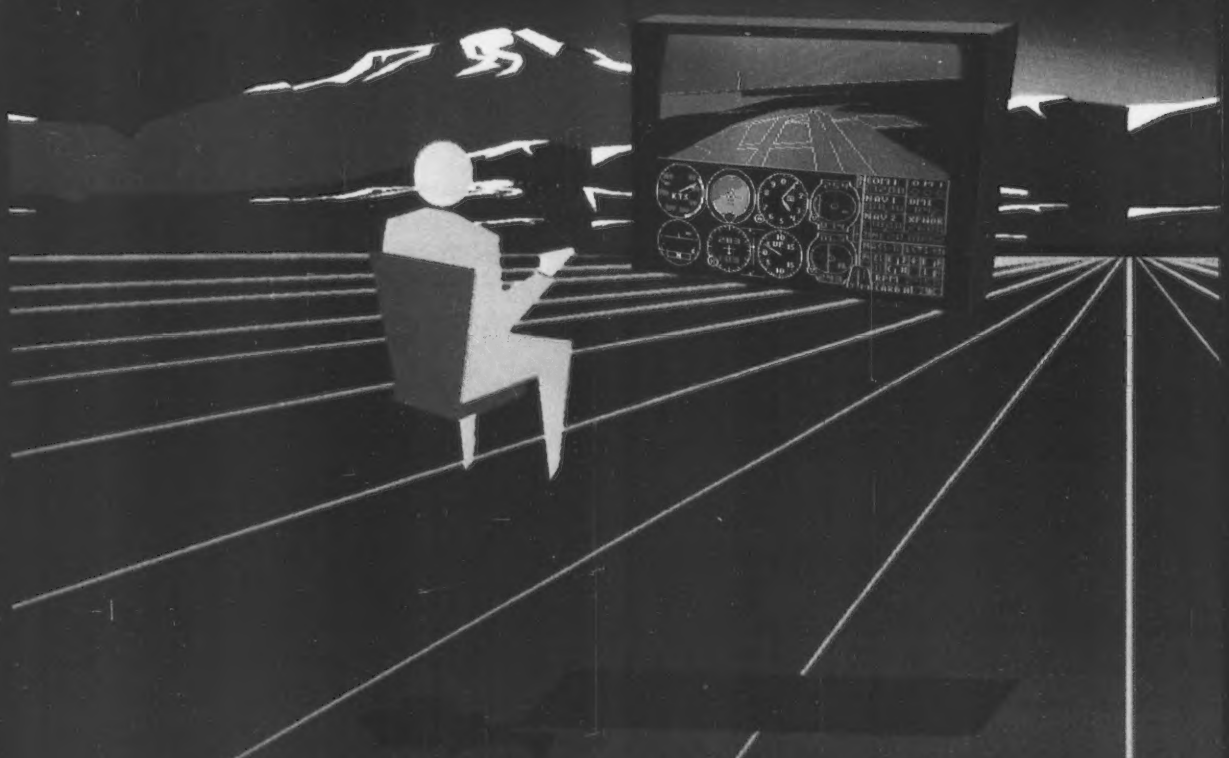

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terested only in creating tours that would be both re-entrant and symmetrical in composition. A re-entrant tour is one in which the last square visited by the knight can lead back to the initial square in only one move. An example of this tour, which is not symmetrical in form, is shown in Figure 3.

Mathematicians were also interested in finding some arithmetic relation between the numbered squares of the completed route. Some were looking for odd and even relationships between adjacent squares or a constant sum, like 260, of squares in each row or column. This latter scheme results in a semi-magic square, in which the diagonals add up to a different sum; no solution to date has provided a perfect magic square and a complete tour of the chessboard at the same time.

J.C. Warnsdorff, a German mathematician, came close to generating all of the possible 31 million solutions. His method, called the Warnsdorff Rule or double-look-ahead, states that the knight should proceed to the square from which the number of available squares during the next two moves is the smallest. Although this rule, developed in 1823, has never been proven accurate, neither has an exception ever been found. The Warnsdorff Rule, more than any other, is useful in both locating the problem areas and providing a way for the knight to eliminate them in advance.

Computing the numbers, to be used for comparison in Warnsdorff's Rule, can be accomplished in four steps. The first step is to find each available square that is adjacent to the knight's present position; these squares are labelled with the letters I, L, and X in Figure 4.

The second step is to count the available squares that can be visited from the squares labelled in step 1; all of the squares thus "adjacent" to the square labelled I are marked with the letter O. So the total number of squares is seven, as indicated by the subscript on the letter I in Figure 4. The square that the knight currently occupies is not counted.

The third step is to count the squares that can be reached from the O squares as noted in the subscripts.

The fourth step is to add up all the numbers calculated in steps 2 and 3; thus, the number computed for the I square would be 7+8+6+4+3+3+4+6 for a total of 41. The number for the L square would be 5+8+8+6+3+4 or 34. After each of the numbers has been calculated for the remaining X labelled squares, the knight moves to the square possessing the smallest value. In this manner, Warnsdorff was able to see in advance the probable trouble areas.

The algorithm I developed to generate the many solutions to this puzzle uses part of Warnsdorff's Rule along with the arbitrary movement method.

With the invention of the computer, a whole new breed of people became interested in the Knight's Tour, a problem that lends itself to computer solution. Both new attempts and such modified ones as Professor Bhairav Joshi's modification of Warnsdorff's Rule (*Creative Computing*, August 1980) have emerged over the last few years. These algorithms have successfully completed the knight's itinerary, but they have neglected the ability of the computer to semi-simulate the human brain.

Past attempts by computer programmers have imposed many restrictions on the movement of the knight; each algorithm could produce only 64 different tours because there are only 64 possible starting squares on the chessboard. However, if you compare the paths generated by different algorithms, you will find that they are totally different.

By incorporating many restrictions in their algorithms, programmers have eliminated the ability of the computer to choose the knight's next move. An example of a program that determines the knight's path before it leaves its initial position is Joshi's modification of Warnsdorff's Rule. In his algorithm, Joshi decided it was better to tell the computer where to move the knight, than to allow the computer the choice of moving the knight into an incomplete tour. Warnsdorff's Rule, however, does allow the algorithm to choose the knight's next move—if there is a tie between the smallest numbers computed. Though it was never proven that this random choice could endanger a solution, Joshi decided it was better to leave it out, thereby limiting the number of routes to 64.

A New Approach

Even if the arbitrary choice were installed in the program, it would still not consider all the possible tours. The reason for this is twofold: first there are the restrictions of examining two moves in

5	2	33	20	15	18	31	62
34	21	4	1	32	63	14	17
3	6	35	46	19	16	61	30
22	45	56	43	64	47	58	13
7	36	23	48	57	52	29	60
24	39	44	55	42	59	12	51
37	8	41	26	49	10	53	28
40	25	38	9	54	27	50	11

Figure 3. Example of a re-entrant tour. Location 64 is one move away from location 1.

				O_4		O_3	
			O_6				O_3
			X		I_7		
		X	O_8			X	O_4
		U_8		K		O_6	
	U_6	X			U_8	X	
			L_5		X		
	U_3				U_4		

Figure 4. Example illustrates Warnsdorff's Rule for I and L squares.

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64

Figure 5. Squares of the chessboard are numbered from left to right.

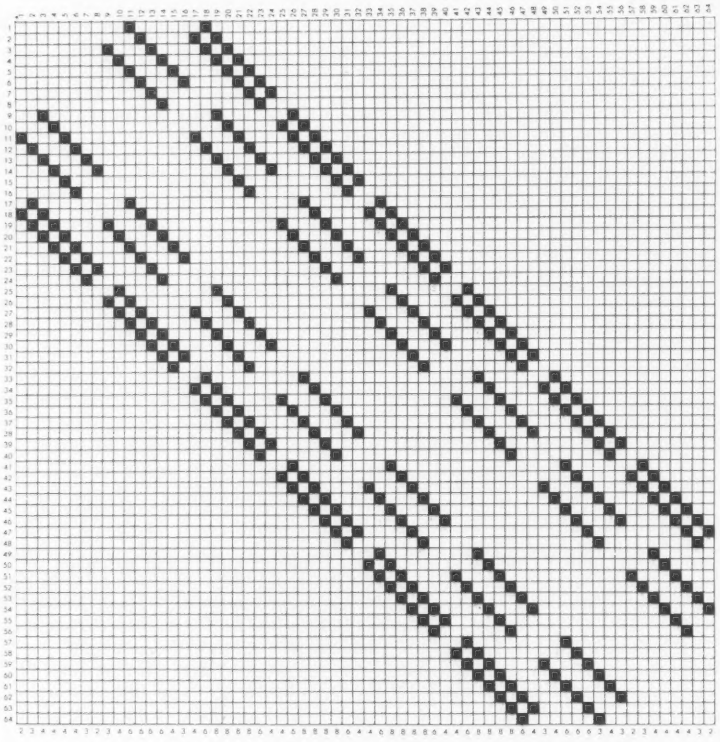

Figure 6. Tabular Form shows legal moves while column totals represent the exit value of each square.

advance, and second, the number associated with the second level adjacent squares is fixed from the start. However, the method presented here makes only one restriction and then allows the computer to make the final decision between moves. There are several methods the computer can use to make arbitrary choices between moves. The most commonly used method, and the one I have incorporated in my program, is the random number generator. Although this method alone can never simulate the indecisiveness of the human brain, it can come close if the generator is truly random in its selection of numbers.

The algorithm I developed to generate the many solutions to this puzzle, uses part of Warnsdorff's Rule along with the arbitrary movement method. I decided that looking ahead, as in Warnsdorff's Rule, was important but not as important as Joshi made it.

By looking so far in advance, Joshi guaranteed success but at the same time greatly reduced the chances of having to make an arbitrary decision. Therefore, I decided to look at only those squares adjacent to the knight's current position. From them the algorithm picks the one with the smallest number of adjacent squares. Not only does this ensure the elimination of problem areas, but it also increases the probability that the computer will have to make a decision, thereby, producing an efficient algorithm that can generate an almost unlimited number of solutions to the Knight's Tour.

Before presenting my algorithm, I must first define and explain four terms needed to ensure the proper results. First, the chessboard (CB) is an 8x8 set of squares, each of which is labelled from left to right, starting with the number 1 in the upper lefthand corner (see Figure 5).

Second, a set that will represent the squares of the newly defined CB is Let S=(1,2,3,...64). Given set S, I can define the binary relation R on S such that (a,b) is in R if and only if there is a legal move from a to b. For example, the pair (1,11) is in R, while the pair (1,5) is not in R. Since the pair (11,1) is also in R, the binary relation R is defined as a symmetrical relation on S. This symmetrical relation permits a simpler determination of the knight's next move. The tabular form, presented in Figure 6, is the basis of the algorithm's computation.

Third, the exit value (EV) of each square on the CB is the total number of legal moves from that square at a given instance during the tour. This EV is produced by scanning the column associated with a sequence in the tabular form and counting each of the X's found as shown in Figure 6. The EV determines the knight's next move in the tour.

The process of choosing the correct square is as follows: 1.) find all of the legal squares by scanning down the appropriate column, finding the square or squares with the smallest EV. 2.) if more than one small EV exists, make an arbitrary choice. It should be noted that the reason for picking the smallest EV in step 1 is the same as described in Warnsdorff's Rule. The arbitrary choice in step 2 is what produces the different tours with my algorithm.

In summary, the algorithm is as follows:

Step 1: Create a 64 x 64 matrix and initialize it by placing a 1 wherever an X appears in the tabular form in Figure 6 and a 0 in the remaining squares. Create the array EV to store the 64 values described above and initialize it by using the values shown in Figure 6. Create an array CB to store the knight's moves and create the variable KMC to keep track of the knight's movement. Initialize KMC to 1.

Step 2: Zero out the matrix row corresponding to the knight's present position (KMC) and subtract 1 from every EV in which a 1 was found in the corresponding column. The reason for this subtraction is to avoid the counting of 1's in each column after every move.

Step 3: Examine the column referred to by the knight's present position (KMC) and find the available square with the smallest EV. If more than one square exists, use a random number generator to determine the next move.

Step 4: Increment the KMC by 1 and mark the proper location in the CB array with the new value.

Step 5: Repeat steps 2 through 4 until the KMC is equal to 64 (a complete tour has been found), or there are no more possible squares to which to move.

Step 6: Print out the CB array, which now contains the knight's current path through the chessboard.

47	2	21	16	33	58	23	14
20	17	48	1	22	15	34	57
3	46	19	32	59	56	13	24
18	31	44	49	38	35	60	55
45	4	39	36	61	54	25	12
30	7	50	43	40	37	64	53
5	42	9	28	51	62	11	26
8	29	6	41	10	27	52	63
17	2	27	48	15	42	29	44
26	37	16	1	28	45	14	41
3	18	49	38	47	40	43	30
36	25	56	61	50	53	46	13
19	4	35	54	39	60	31	52
24	55	22	57	62	51	12	9
5	20	63	34	7	10	59	32
64	23	6	21	58	33	8	11
5	2	23	54	21	52	17	56
24	47	4	1	58	55	20	51
3	6	59	22	53	18	57	16
46	25	48	39	60	63	50	19
7	38	45	64	49	34	15	62
26	43	28	37	40	61	12	33
29	8	41	44	31	10	35	14
42	27	30	9	36	13	32	11
33	2	29	24	25	20	17	22
28	25	34	1	30	23	36	19
3	32	27	56	59	18	21	16
26	57	64	31	48	51	60	37
63	4	55	58	61	44	15	50
10	7	62	47	52	49	38	41
5	54	9	12	43	40	45	14
8	11	6	53	46	13	42	39
37	2	19	24	35	26	17	14
20	23	36	1	18	15	34	27
3	38	21	62	25	60	13	16
22	55	40	57	64	47	28	33
39	4	63	48	61	32	59	12
54	7	56	41	58	49	46	29
5	42	9	52	31	44	11	50
8	53	6	43	10	51	30	45

Figure 7. Shows several completed tours from the same starting square. The program located 64 different tours from starting square 12.

I tested my algorithm on an old IBM 1130 computer using an outdated version of Fortran IV. I generated 20 different itineraries in three seconds of CPU time using the number generator, as compared to 4.946 seconds by Professor Joshi on an Itel AS/6 computer in APL.

I then generated 64 different tours from the same starting square in 9.6 seconds. This is compared to Professor Joshi's time of 6 seconds for 64 itineraries from different starting points. The number of different tours that may be generated and tested by my algorithm depends on the random number generator of the system. The memory of the computer should be able to store the calculations of each new tour generated for comparison with the other tours previously created by the algorithm. ■

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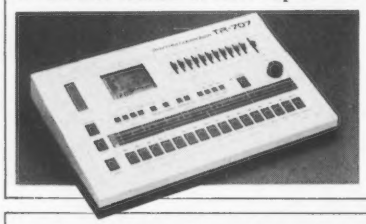

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(213) 685-5141

CIRCLE **407** ON READER SERVICE CARD

Spinwriter Dot Matrix Printer

NEC Information Systems has announced the Spinwriter Elf 360 and Elf 370, 190 cps bidirectional dot matrix printers that feature proportional spacing, bold and shadow print, and auto load.

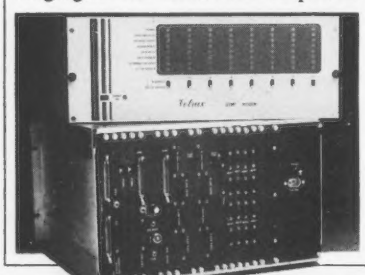
The $595 Elf 360 connects to most personal computers, including the Apple II series, IBM PC, DEC, and Hewlett Packard computers. An optional accessory kit allows it to hook up to a Macintosh. The $545 Elf 370 is plug compatible with the IBM PCjr.

NEC Information Systems
1414 Massachusetts Ave.
Boxborough, MA 01719
(617) 264-8000

CIRCLE **408** ON READER SERVICE CARD

Touch Tone Modem

Votrax has unveiled the DTMF Modem, a modem that converts the analog signals from touch tone telephones into digital signals, transfers the data to a speech synthesizer, and produces audio responses. It offers Bell 407 standard compatibility, full duplex operation, and direct connection via a standard RJ11 telephone jack. The DTMF modem retails for $700.



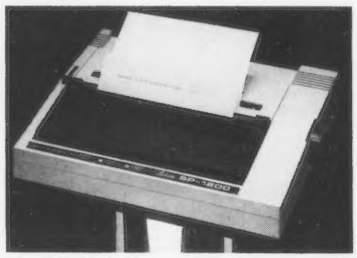
A demonstration is available by calling (313) 588-0181.

Votrax
1394 Rankin
Troy, MI 48083
(313) 588-2050

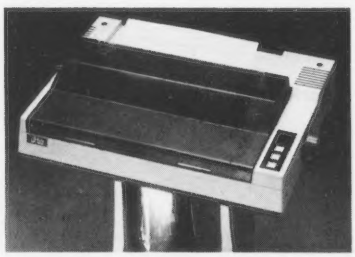
CIRCLE **409** ON READER SERVICE CARD

Sakata Printers

Sakata, well known for its quality monitors, has introduced two bidirectional dot matrix printers, the SP-1200 and the SP-1500.



The SP-1200 features 120 cps print speed, Centronics parallel port, and eight-language international character font. It supports emphasized, superscript, subscript, proportional, and graphics printing and retails for $389.



The SP-1500 features 180 cps print speed, Centronics parallel port, international character font, 3K buffer, and 256 user-defined characters. It supports boldface, emphasized, super- and subscript, underlined and condensed printing, and retails for $585.

Sakata USA
651 Bonnie Lane
Elk Grove Village, IL 60007
(312) 593-3211
(800) 323-6647

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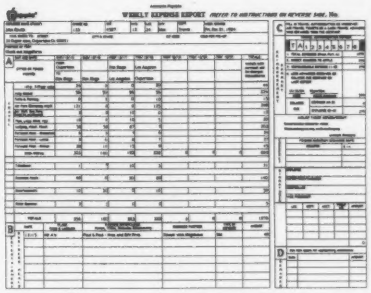
What's New In Software

Russ Lockwood

MegaForm from MegaHaus

MegaHaus has introduced *MegaForm*, a forms and report generator for the Macintosh 512K (Fat Mac) that acts like a spreadsheet, graphics package, and database. It is completely compatible with the Macintosh Office, including the LaserWriter printer and networking capabilities. Several ready-made forms are supplied on disk. The package retails for $295.

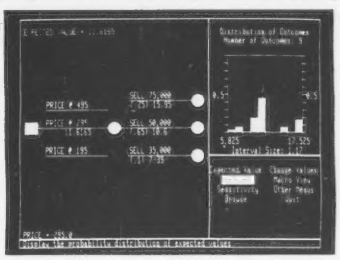


MegaHaus
5703 Oberlin Dr.
San Diego, CA 92121
(619) 450-1230

CIRCLE **411** ON READER SERVICE CARD

Decision Support Software from TI

Texas Instruments has released *Arborist Decision Tree*, a general purpose program for modeling and analyzing business situations. It uses graphics to display the decision tree structure, makes use of windows, and automatically recalculates data.



Aborist Decision Tree requires a TI Professional with 512K RAM, one drive, and the three-plane graphics adapter. The retail price has not been set. A color monitor is optional.

Texas Instruments
P.O. Box 809063
Dallas, TX 75380
(800) 527-3500

CIRCLE **412** ON READER SERVICE CARD

Databases for the Home

MicroLab has announced *HomeFiler*, a database for the home requiring a 48K Apple II series computer with two disk drives. Each record can hold up to 88 fields of up to 239 characters each. *HomeFiler* sells for $50.

Microlab
2699 Skokie Valley Rd.
Highland Park, IL 60035
(312) 433-7550

CIRCLE **413** ON READER SERVICE CARD

Cardco has released *File Now*, a database for the Commodore 64. It holds up to 700 records per file and includes editing features. It is compatible with *Write Now*, Cardco's word processor, and retails for $39.95.

Cardco
300 S. Topeka
Wichita, KS 67202
(316) 267-6525

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Statistical Forecasting

Actuarial Micro Software has released two statistical packages for the Apple II series and IBM PC computers.

Monte Carlo Simulations (MCS) combines statistical analysis and business forecasting using the Chi-Square Goodness of Fit Test to match data to a standard probability distribution. It retails for $125.

General Application Simulation System (GASS) combines up to 10 variables in one algorithm to create a statistical model and quantify risks. *GASS* retails for $325. *GASS* and *MCS* together sell for $395.

Actuarial Micro Software
3915 A Valley Ct.
Winston-Salem, NC 27106
(919) 765-5588

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Odesta Helix

Odesta has released *Helix*, a combination database and decision support system for the Macintosh 512 (Fat Mac) and Lisa computers. It performs filing, sorting, and retrieving functions and performs complex modeling and analysis tasks. *Helix* includes sample applications and retails for $395.

Odesta
3186 Doolittle Dr.
Northbrook, IL 60062
(312) 498-5615

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Smartcom for Mac

Hayes Microcomputer Products has adapted its *Smartcom II* communications software for the Macintosh. It supports the Hayes SmartModem 2400, a 2400/1200/300 baud modem, and uses all the graphics capabilities of the Macintosh. *Smartcom II* for the Macintosh retails for $149.

Hayes Microcomputer Products
5923 Peachtree Industrial Blvd.
Norcross, GA 30092
(404) 449-8791

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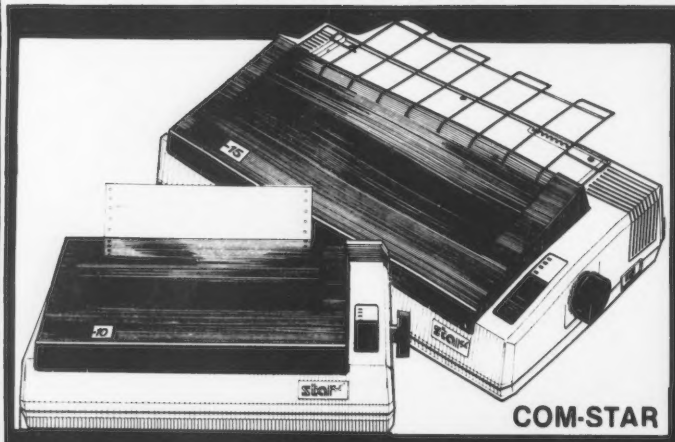

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The COM-STAR PLUS+ gives you all the features of the COMSTAR T/F PRINTER plus a 10" carriage, 120-140 CPS, 9 x 9 dot matrix with double strike capability for 18 x 18 dot matrix (near letter quality), high resolution bit image (120 x 144 dot matrix), underlining, back spacing, true lower descenders with super & subscripts, prints standard, italic, block graphics & special characters. It gives you print quality and features found on printers costing twice as much!! (Centronics Parallel Interface) (Better than Epson FX80). RATED "BEST BUY" BY CONSUMERS DIGEST BUYERS GUIDE, JANUARY 1985! List $499.00. **Sale $199.00.**

Premium Quality 120-140 CPS 15½X COM-STAR PLUS+ Business Printer $319.00

Has all the features of the 10" COM-STAR PLUS+ PRINTER plus 15½" carriage and more powerful electronics components to handle large ledger business forms! (Better than Epson FX 100). List $599. **Sale $319.00.**

Superior Quality 15½" COM-STAR PLUS+ H.S. High Speed 160-180 CPS Business Printer $449.00

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"JUKI" Superb letter quality daisy wheel printer, 12" extra large carriage, up to 12CPS bi-directional printing, drop-in cassette ribbon, (90 day warranty) centronics parallel or RS232 serial port built in! (Specify). List $299.00. **Sale $199.00.**

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This **Super High Speed Com-Star+ Business Printer** has all the features of the 10" COM-STAR+ PRINTER with HIGH SPEED BUSINESS PRINTING 160-180 CPS, 100% duty cycle, 8K Buffer, diverse character fonts, special symbols and true descenders, vertical and horizontal tabs. **A RED HOT BUSINESS PRINTER** at an unbelievable low price (Serial or Centronics Parallel Interface). List $699.00. **Sale $349.00.**

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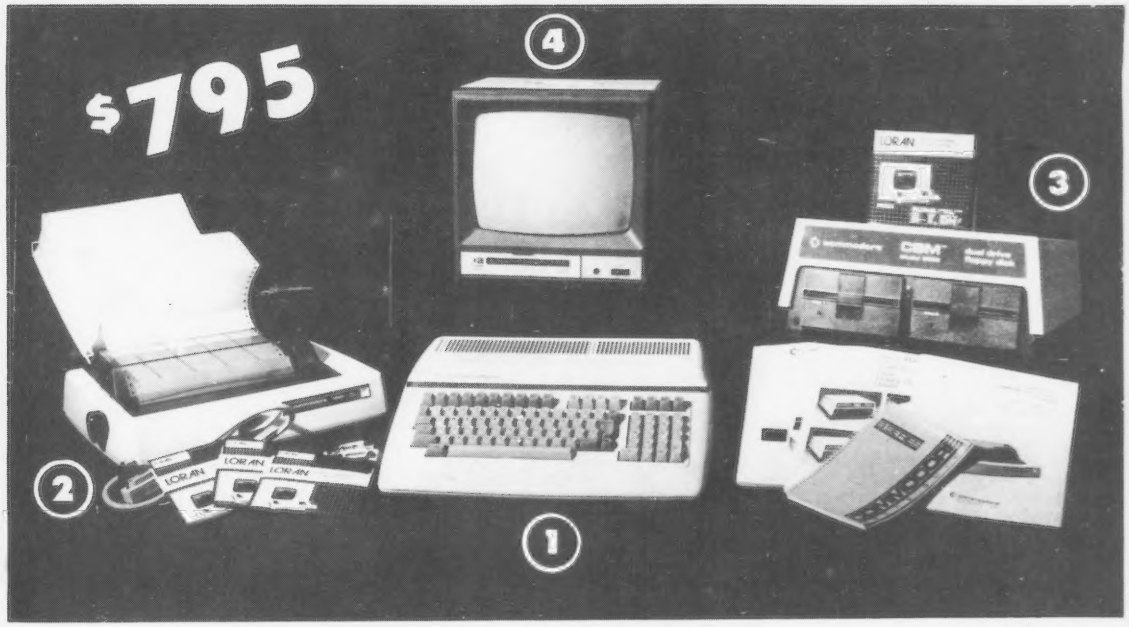

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Escher Sketch Pad

Edward H. Carlson

The computer is a splendid toy for the mind. Play is nature's classroom, teaching adult and child alike about the possible and the impossible in this amazing universe we skate through. I hope you will join me over the next months in playing with the computer and the ideas that it can model for us.

This month we sketch some intriguing doodles. In later columns I will model the population explosion of castaways on a desert isle, help you invent planets in alternate solar systems, analyze the concepts that underlie management games—*M.U.L.E.* and Hammurabi, for example—relating them to economics, and help you build many other computer toys. Please write to me at *Creative Computing* if you have ideas you would like to contribute.

Escher and the Arabs

Among the many fascinating drawings of Maurits Cornelis Escher are some that tile all space with interlocking figures—angels and devils, birds and fish, horsemen, lizards, and various grotesque monsters. The figures not only fill plane space, leaving no gaps and by repetition extend to infinity, but often are related to one another by certain rotation and reflection symmetries.

Islamic artists (forbidden to represent life forms in their art) created many such tilings with purely geometric forms of intricate design. Escher in his travels studied the Arabic decorations of the Alhambra palace in Granada, Spain (the palace in which Isabella and Ferdinand met with Columbus and approved his plan to sail west to the Indies).

Grab pencil and paper and try to sketch a simple Escher-like drawing—maybe a side view of a cat standing with all four feet showing and legs intertwining with those of another cat, upside down and facing the other way. You find yourself struggling to interlock the figures properly. Now load the program in Listing 1 and draw on the screen. Automatically the figures related by symmetry to the one you are drawing appear on the screen so you can detect any gaps and overlaps immediately. Unless you are somewhat artistic and very patient, you may not produce a satisfactory Escher-like interlocking drawing at all.

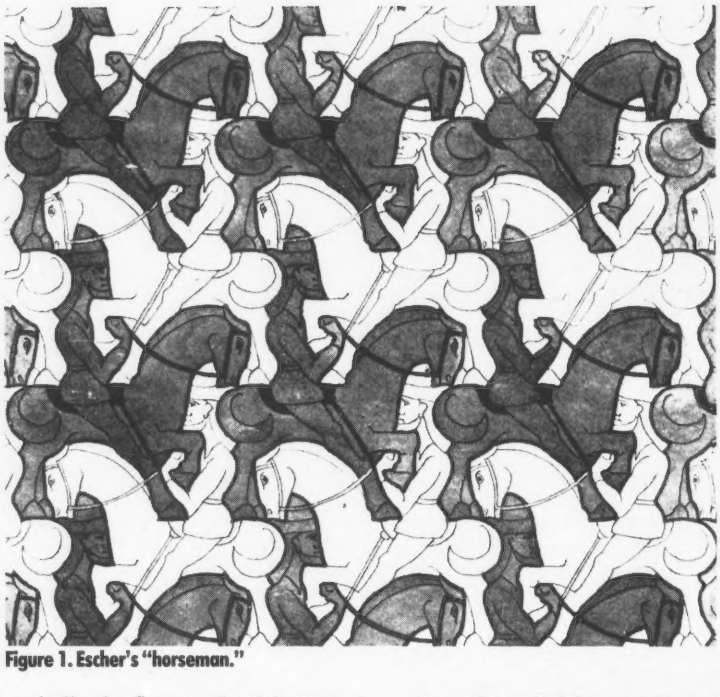

Figure 1. Escher's "horseman."

© M.C. Escher Heirs, c/o Cordon Art BV Baarn (Holland).

OK then, dream you are the architect for a Moorish sultan's harem, and design intricate tile patterns of high symmetry. In either case, borrow or buy a book of Escher's work and analyze the drawings in light of what the computer program shows you about symmetry in the tiling task.

Staring at the Harem Floor

The theory of tiling (tesselation) needs only a few concepts.

An outline, called the *unit cell*, must fill the plane when you lay copies of it side by side—no gaps, no overlaps, and all cells oriented the same way. That is, you slide one cell (without letting it twist) by its own length to get a neighboring cell. Such a sliding is called a *translation*.

"But" you say, "how about the common bathroom tile of octagons and squares—two dissimilar shapes that together tile the plane?" All such composite outlines as well as irregular outlines like Escher's "horseman" (Figure 1) can be included by adding inner structure to the basic outlines: parallelogram, rectangle, square, and hexagon.

The cells rarely show up in the final drawing explicitly. To detect a cell you

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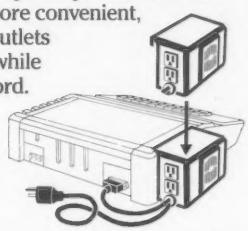

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Impurities in the power supply cause 70-90% of all microcomputer malfunctions. Line noise can be interpreted as data, confusing your Apple and causing annoying system errors. Power surges and spikes can do costly damage to your computer's delicate circuitry.

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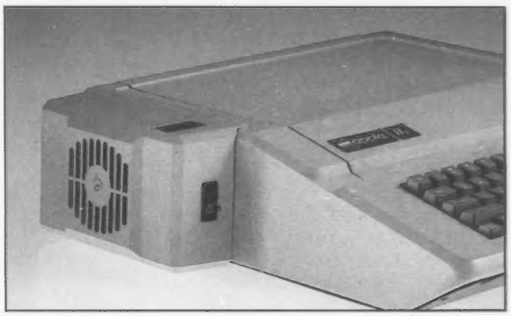

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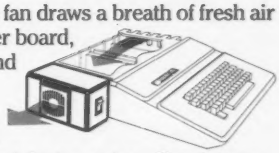

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CIRCLE 115 ON READER SERVICE CARD

must reconstruct it by marking repeated elements with a dot and then joining the dots by lines. For example, dot the tip of the front hoof of every white horse in the Horsemen drawing. The infinite set of dots you get is called the *lattice*. Now connect four adjacent dots and you will see the rectangular unit cell. The cell for a given drawing is unique in size and shape, but not in location. If you choose to dot the chin of each black warrior you would get the same set of rectangular cells, but displaced from the "hoof" cells.

Added to the lattice of cells are three kinds of symmetry elements: rotations, reflections, and glides. The requirement that no overlaps or gaps be present in the tiling of the plane can be satisfied in exactly 17 combinations of cell shape and symmetry elements. These are called the 17 plane space groups, and each is named with a special symbol (see lines 2316 through 2348 of Listing 1). In these symbols, p stands for primitive cell (having lattice points at the corners of the cells only) and c for centered, having also a lattice point in the center of each cell. The numbers stand for n-fold rotation axes, m for mirror planes, and g for glide planes.

N-fold axes of rotation are important in many of Escher's drawings. Only values of n = 2,3,4,6 are allowed by mathematical consistency with the tiling idea. (N = 1 means no rotations at all.) By a "two-fold axis" we mean this: Taking an axis perpendicular to the paper, you rotate the drawing by one half a turn. The whole plane of figures will rotate into coincidence with itself.

A two-fold axis does not impose any conditions on the cell shape, but a four-fold axis can be present only when the cell is a square, and then only at the corners or center of the square. Likewise, a three-fold or six-fold axis requires the cell be hexagonal in shape.

Look for reflection planes in Escher's drawings. Holding a pocket mirror perpendicular to the page and moving it around, you may find a spot where the reflection in the mirror exactly matches the part of the drawing you see if you remove the mirror. If so, draw a line along the base of the mirror and you have marked a reflection plane. Planes tiled with oblique cells (non-rectangular parallelograms) cannot have reflection planes.

You can also detect the presence of reflection planes by just eyeballing the drawing. A symmetric figure, such as the front view of a soldier standing at attention, has a reflection plane (line, really) as the midline from head to toe. Nonsymmetric figures that occur in pairs related like the right and left hand of a glove have a reflection plane half way between them if the line joining equivalent points (tip of each thumb) is perpendicular to the reflection plane. (If not, you have a glide plane.)

Glide planes are a combination of reflection and translation that have no counterpart in everyday life.

Glide planes are a combination of reflection and translation that have no counterpart in everyday life. The horsemen drawing of Escher shows the presence of a glide plane in this way: Each horseman is a mirror image in form (related as right glove to left glove) of one facing the other way (of opposite color) but is not correctly placed to be a mirror image. In fact, each horseman is a mirror image "glided" by a half cell height from the mirror position.

Escher colored his tile prints so the viewer could distinguish each figure from its neighbors. Ignore the colors when saying that one figure reflects, rotates, translates, or glides into another.

More about cell shapes: Symmetry does not restrict the proportions of

Listing 1. Escher Sketch Pad.

```
1 GOTO 2000: ================= ESCHER SKETCH PAD ============================
2 REM file name:ESCHER              disk name:CC                  E. H. Carlson
100 REM ========================== main loop ================================
120 ON G GOSUB 410,420,430,440,450,460,470,480,490,500,510,520,530,540,550,560
,570
130 GOSUB 200                                 :REM user draws
140 GOTO  120                                 :REM plot points
200 REM ====================== get dot for screen ============================
205 X1=X:Y1=Y                                 :REM save dot to erase
210 CH$=INKEY$:IF CH$="" THEN 210             :REM get keyboard command
211 IF CH$="Q" THEN WIDTH 80:END              :REM restore screen and end
212 IF CH$=" " THEN 249                       :REM toggle to other draw modes
220 IF CH$="I" THEN Y=Y-1:IF Y<-A2 THEN Y=Y+A :REM up, don't go off screen
221 IF CH$="M" THEN Y=Y+1:IF Y> A2 THEN Y=Y-A :REM down
222 IF CH$="J" THEN X=X-1:IF X<-B2 THEN X=X+B :REM left
223 IF CH$="K" THEN X=X+1:IF X> B2 THEN X=X-B :REM right
240 IF M<3 THEN RETURN                        :REM plot or erase all sym dots
241 PSET(X1+W2,Y1+H2),0:PSET(X+W2,Y+H2):GOTO 200:REM erase old, move new dot
249 LOCATE 2,2                                :REM move cursor to upper left
250 M=M+1:IF M>3 THEN M=1                     :REM toggle to other draw modes
251 IF M=1 THEN E=3:PRINT "DRAW ":RETURN      :REM draw  mode
252 IF M=2 THEN E=0:PRINT "ERASE":RETURN      :REM erase mode
253 IF M=3 THEN     PRINT "MOVE ":GOTO 200    :REM move  mode
350 REM ================== print dot in all cells ============================
352 PSET(XX+W2,YY+H2),E                       :REM put original      dot on screen
354 X2=XX-A2    :IF XX<0 THEN X2=XX+A2
356 PSET(X2+W2,YY+H2),E                       :REM put left          dot on screen
358 X3=XX-A2+AC:IF XX<0 THEN X3=X3+A
360 Y2=YY-B2    :IF YY<0 THEN Y2=YY+B2:X3=X3-2*AC
362 PSET(X3+W2,Y2+H2),E                       :REM put upper left    dot on screen
364 X4=XX+AC
366 Y2=YY-B2    :IF YY<0 THEN Y2=YY+B2:X4=X4-2*AC
368 PSET(X4+W2,Y2+H2),E:RETURN                :REM put upper center dot on screen
410 REM ------------------------------------------------------------ no symmetry
411 XX= X   :YY= Y   :GOSUB 350:RETURN        :REM plot original points
420 REM ------------------------------------------------------- two-fold axis
421 XX= X   :YY= Y   :GOSUB 350               :REM plot original points
424 XX=-X   :YY=-Y   :GOSUB 350:RETURN        :REM 2-fold rotation
430 REM ------------------------------------------------- reflection plane
431 XX= X   :YY= Y   :GOSUB 350               :REM plot original points
435 :        YY=-Y   :GOSUB 350:RETURN        :REM reflection
440 REM ---------------------------------------------------------- glide plane
441 XX= X   :YY= Y   :GOSUB 350               :REM plot original points
442 XX= X+A4:YY=-Y   :GOSUB 350:RETURN        :REM glide plane
450 REM ------------------------------------------------------ centered cell
451 XT= X   :YT= Y   :GOSUB 430               :REM reflection plane
452 X = X+A4:Y =-Y+H4:GOSUB 430               :REM glide plane
456 X = XT  :Y= YT              :RETURN       :REM restore X,Y and return
460 REM ------------------------------------------------- 2 reflection planes
461 :                GOSUB 420                :REM two fold axis implied
462 XX= X   :YY=-Y   :GOSUB 350               :REM first reflection
465 XX=-X   :YY= Y   :GOSUB 350:RETURN        :REM second reflection
470 REM ------------------------------------------------ reflection and glide
471 :                GOSUB 420                :REM two fold axis implied
472 XX= X   :YY=-Y+H4:GOSUB 350               :REM reflection
478 XX=-X   :YY= Y+H4:GOSUB 350:RETURN        :REM glide
480 REM ------------------------------------------------------- 2 glide planes
481 :                GOSUB 420                :REM two fold axis implied
482 XX= X+A4:YY=-Y+H4:GOSUB 350               :REM first glide
```

rectangular or oblique cells, nor the angle in oblique cells. In fact, a rectangular or oblique cell could "accidentally" be square in shape. Each cell contains an integer number of complete figures. (A figure often extends outside the boundaries of the cell. If so, there must be an equivalent part extending into the cell from one corresponding figure in another cell.)

The Dancing Dots

The program is written in Basic on an IBM PC. I have been careful to keep the program as free as possible from special features of the IBM, and hope you can adapt it easily to your computer. Apple and Commodore machines, and Atari and Radio Shack machines using Microsoft Basic, can accept this program with only a few lines changed. I have kept the program simple. It uses the medium resolution black and white screen, and the I, J, K, and L keys to move the cursor for drawing. You may want to use color, low or high resolution, arrow cursor keys, or other special features of your own machine.

Lines 400 to 599 of the program are its geometrical heart and can be moved unchanged to any computer. Each of the 17 space groups is generated by a few lines of code giving the x and y coordinates of all equivalent points in a given cell.

In lines 350 to 399, the dots are written on the screen for four complete cells. One cell has its upper left lattice point in the center of the drawing, and from this point you move the dot that draws the figure. For other computers, you may need to change the PSET command to a PLOT or use a LOCATE or similar manner of putting a dot or character on a specified part of the screen.

Lines 200 to 299 let the program user move the dots around on the screen, and erase dots. These lines can in principle be moved to any other computer, but some changes may have to be made, such as changing the INKEY$ construction of the IBM to a GET or INPUT.

For low symmetry cases, the program is moderately fast. You can input about five points per second. But when you are drawing high symmetry diagrams in which the computer must compute the location of up to 48 points for each point you input, and place them on the screen, the pace slows to about one point per second.

Enjoy the program. May all your figures interlock, on the screen and as you skate through life. ■

```
486 XX=-X+A4:YY= Y+H4:GOSUB 350:RETURN      :REM second glide
490 REM ------------------------------------------------------ centered cell
491 XT= X    :YT= Y    :GOSUB 460            :REM reflection
492 X = X+A4:Y =-Y+H4:GOSUB 460            :REM glide plane
496 X = XT   :Y = YT              :RETURN   :REM restore X,Y and return
500 REM ------------------------------------------------------ 4-fold axis
501 XX= X    :YY= Y    :GOSUB 350            :REM plot original points
502 XX=-X    :YY=-Y    :GOSUB 350            :REM half turn
504 XX=-Y    :YY= X    :GOSUB 350            :REM quarter turn
506 XX= Y    :YY=-X    :GOSUB 350:RETURN     :REM reverse quarter turn
510 REM ------------------------------------------------ 4-fold and reflection
511 XT= X              :GOSUB 500            :REM 4-fold axis points
513 X =-X              :GOSUB 500            :REM reflect
514 X = XT                        :RETURN   :REM restore X,Y and return
520 REM ------------------------------------------------------ 4-fold and glide
521 XT= X    :YT= Y    :GOSUB 500            :REM 4-fold axis points
523 X =-XT+L4                              :REM glide plane
524 Y = YT+L4          :GOSUB 500
525 X = XT   :Y = YT              :RETURN   :REM restore X,Y and return
530 REM ------------------------------------------------------ 3-fold axis
531 XX= X    :YY= Y    :GOSUB 350            :REM plot original points
533 XX= X*CO+Y*SI                          :REM rotate by  120 degrees
534 YY=-X*SI+Y*CO     :GOSUB 350
535 XX= X*CO-Y*SI                          :REM rotate by -120 degrees
536 YY= X*SI+Y*CO     :GOSUB 350:RETURN
540 REM ------------------------------------------------ 3-fold with reflections
541 XT= X              :GOSUB 530            :REM plot original points
542 X =-X              :GOSUB 530            :REM reflect in vertical plane
545 X = XT                        :RETURN   :REM restore X and return
550 REM ------------------------------------------------ 3-fold with reflections
551 YT= Y              :GOSUB 530            :REM plot original points
552 Y =-Y              :GOSUB 530            :REM reflect in horizontal plane
555 Y = YT                        :RETURN   :REM restore Y and return
560 REM ------------------------------------------------------------ 6-fold
561 XT= X    :YT= Y    :GOSUB 530            :REM plot original points
562 X =-XT*CO+YT*SI                        :REM rotate by 60 degrees
563 Y =-XT*SI-YT*CO   :GOSUB 530
565 X = XT   :Y = YT              :RETURN   :REM restore X,Y and return
570 REM ------------------------------------------------ 6-fold with reflections
572 YU= Y              :GOSUB 560            :REM plot original points
573 Y =-YU             :GOSUB 560            :REM reflect
575 Y = YU                        :RETURN   :REM restore Y and return
2000 REM ==================== variables and arrays ============================
2110 W =320  :H =200                       :REM screen width and height
2111 W2=W/2  :H2=H/2:W4=W/4:H4=H/4         :REM half screen sizes
2112 R =W*.85:R2=R/2:R4=R/4                :REM oblique cell size
2113 L =200  :L2=L/2:L4=L/4                :REM cell size
2120 X =0    :Y =0                         :REM start drawing in center of screen
2130 PI=3.141593
2134 C =L4   :D =L2*SIN(PI/3)              :REM triangular cell positions
2135 SI=SIN(PI/3)   :CO=-.5                :REM sin and cos of 120 degrees
2140 M =1    :E =3  :CH$=" "               :REM initially--draw mode
2200 REM ===================== initial screen ================================
2210 CLS:PRINT:PRINT:PRINT                 :REM clear screen
2215 PRINT"     ESCHER SKETCH PAD":                    PRINT:PRINT
2220 PRINT" PRESS CAPS LOCK":                          PRINT
2222 PRINT" CHOOSE SYMMETRY FROM MENU":                PRINT
2224 PRINT" I, J, K, M KEYS TO MOVE DOT":              PRINT
2226 PRINT" SPACE BAR TO TOGGLE FROM DRAW TO NO DRAW MODE":PRINT
2228 PRINT" PRESS Q KEY TO QUIT":                    PRINT:PRINT
2230 PRINT" (PRESS SPACE BAR TO CONTINUE)":            PRINT
2235 CH$=INKEY$:IF CH$="" THEN 2235
2300 REM ==================== user inital input ==============================
2310 CLS:PRINT:PRINT:PRINT                 :REM clear screen
2314 PRINT "              PICK THE SYMMETRY":PRINT
2316 PRINT " 1  OBLIQUE                                  p1
2318 PRINT " 2  OBLIQUE      2-FOLD AXIS                 p211
2320 PRINT " 3  RECTANGULAR REFLECTION PLANE             p1m1
2322 PRINT " 4  RECTANGULAR GLIDE       PLANE            p1g1
2324 PRINT " 5  RECTANGULAR CENTERED & 2 PLANES          c1m1
2326 PRINT " 6  RECTANGULAR TWO REFLECTION PLANES        p2mm
2328 PRINT " 7  RECTANGULAR REFLECTION AND GLIDE         p2mg
2330 PRINT " 8  RECTANGULAR TWO GLIDE PLANES             p2gg
2332 PRINT " 9  RECTANGULAR CENTERED TWO REFLECTION      c2mm
2334 PRINT " A  SQUARE       4-FOLD AXIS                 p4
2336 PRINT " B  SQUARE       REFLECTION PLANES           p4mm
2338 PRINT " C  SQUARE       REFLECTION AND GLIDE        p4gm
2340 PRINT " D  HEXAGONAL    3-FOLD AXIS                 p3
2342 PRINT " E  HEXAGONAL    REFLECTION PLANES           p3m1
2344 PRINT " F  HEXAGONAL    REFLECTION PLANES           p31m
2346 PRINT " G  HEXAGONAL    6-FOLD AXIS                 p6
2348 PRINT " H  HEXAGONAL    6-FOLD AND REFLECTIONS      p6mm
2360 Y$=INKEY$:IF Y$="" THEN 2360          :REM user makes choice
2361 G=ASC(Y$)-48:G=G+7*(G>9)              :REM change input to number
2370 A2=R2:B2=H2:A=R:B=H:AC=0:A4=R4        :REM rectangular cells
2371 IF G<3                  THEN AC=20                          :REM oblique
2372 IF G=10 OR G=11 OR G=12 THEN A2=L2:B2=L2:A=L:B=L  :AC=0     :REM square
2373 IF G>12                 THEN A2=L2:B2=D :A=L:B=D*2:AC=L4  :REM triangular
2390 SCREEN 2,0:CLS:WIDTH 40               :REM medium res. color screen, clear
2399 GOTO 100                              :REM begin drawing
9998 REM Other computers: use GET and PLOT for INKEY and PSET
9999 REM Not direct substitutions--see reference manual
```

IBM IMAGES

Notes on the AT and hard disk subsystems

Will Fastie

It's a bird! It's a plane! Well, it sounds like a plane, anyway. That is, my new computer sounds like a plane, and a loud jet plane at that. But I'm getting ahead of myself: this is the end of the story. Let's start at the beginning.

A little over a month ago, *PC Tech Journal's* first PC/AT arrived. About two weeks ago, it was installed on my desk, and my aging(!) XT was passed on to a new member of the staff. The beginning of the story is therefore about IBM's so-called Advanced Technology Personal Computer, aka the IBM PC/AT.

If you want to know everything there is to know about the AT (well, just about everything), take a look at the December issue of *PC Tech Journal*. The description here is from a different point of view: I'm pretending to be just an ordinary, mortal, end-user, installing my new computer. In fact, I try to be more than an end-user because I ask my local ComputerLand *not* to install or otherwise check out the equipment we buy from them. Instead, I like to open the boxes myself, see how IBM packages and what's actually in the box, and see just how hard it is to figure out what to do.

The AT is surprising in this way. I expected about the same level of difficulty normally associated with installation of a regular PC or XT, but the AT is simpler. Furthermore, IBM has included two charts, poster-like affairs that have the major points of installation called out along with pointers to the documentation for more complete explanations. The charts cover all the bases—at least in the context of the time frame in which the AT was announced (more on this in a minute).

IBM has cleverly packaged the documentation in an attempt to get the installer to look at it. The books (Guide to Operation, Installation and Setup, Basic) and the charts come in a separate box along with the power cord; the box is marked "Open this box first!" Yes, you can reach right past the books for the cord, but at least you see the books and charts and therefore might understand that they might be helpful. In fact, it is important to open at least the Guide to Operations because that is where the Diagnostics disk is found; it is a most important player in the setup of an AT.

Once the documents have been found, the charts guide you through the setup process. One chart has the necessary instructions for the installation of internal options (boards, etc.). At least one option, a display adapter, needs to be added, and the battery needs to be connected, so these instructions are important. The second chart has the basic setup instructions for cabling and startup.

A significant improvement over prior PCs exists on the AT. In short, the DIP switches on the system board have been removed and replaced by battery operated memory. There are only two physical switches that need be considered, one inside the unit and one outside. Inside, a slide switch is used to tell the system which type of display will be the default. I'm not sure why this couldn't have also been put in memory, and it did prove to be the only point of confusion I encountered during the setup; I installed neither the IBM Monochrome nor the IBM Color/Graphics (CGA) adapter, the only two options documented. Outside, a switch on the power supply comes set to 230 volts and must be reset to 115. I found that curious, because IBM told me that the plant in Boca Raton builds only for North America, so I would expect the default to be 115. ATs for Europe are built in Scotland.

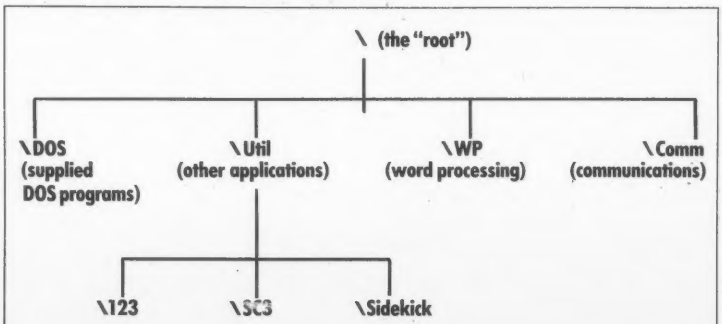
My big installation confusion came over the IBM Enhanced Graphics Adapter. When the AT was announced, only the two original adapters were available from IBM, and the installation documentation reflects this fact. I was quite confused about how to set the internal switch, and neither the AT documents nor the pile of paper that came with the EGA could bail me out.

I finally decided that the EGA could be considered a color adapter, so I set the switch accordingly. I plan some further experimentation to determine the effect of the switch; as it stands now, most of the software I use thinks a color board is installed and uses color, even if I prefer otherwise.

Connecting the battery is simple, but a flashlight is helpful to find the pin connector on the system board. The plug on the little cable is keyed, which means that it will fit only one way. Once connected, you can forget about it until the battery dies. The battery itself is about the size of a Zippo cigarette lighter and is attached to the rear of the cabinet by a Velcro strip. The battery *must* be installed to set the system configuration properly.

Once everything is installed and cabled, the next step is to turn on the system and boot the diagnostics disk. It is a good idea to run the diagnostics, but the

Table 1. Typical Directory Structure. The root directory contains AUTOEXEC.BAT, CONFIG.SYS, COMMAND.COM, and a few other files which must reside in the root. Otherwise, it is kept as empty as possible for neatness.



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important part is the setup program. You will know you need to run SETUP, because when the AT boots, it complains if its configuration memory is empty. The SETUP program is simple to use and speaks English for the most part. You will need to collect some information (amount of memory installed, type of hard disk) but IBM has provided a checklist for recording these items; if you use the checklist when you are performing the installation, you will have everything you need for SETUP. A nice feature of the AT is its built-in clock/calendar, and SETUP is the vehicle for getting proper values of the time and date initialized.

After SETUP, every boot of the system will read the time, date, and configuration memory. The AT maintains compatibility with its other family members by storing the configuration in absolute memory location 0040:0010 (aka 410), so application programs should feel at home.

Now that your AT is ready to run, all that is left is to install DOS—version 3.0 (or later) required. I'm making the assumption that most ATs will have a fixed disk, so the process is to boot DOS from diskette, run FDISK, run FORMAT /S, and then add files to your disk as desired. Table 1 shows how I typically organize my directory structure, and Figure 1 is a listing of the AUTOEXEC.BAT file I use to get going.

EGA Confusion

My confusion with the Enhanced Graphics Adapter was enhanced by the mound of documentation that came with it. In a way, it is funny. Installation of the AT is really the simplest of any PC family member yet, but it is the most well supported with documents. Better some of the effort should have been spent on the EGA. In particular, one of those charts would have been very helpful. The chart could give the big picture by acting as a roadmap and explaining what each of the individual documents was for.

At the moment, each one says things like "I am package 4. If you haven't opened Package 1, do so first." Yeah, but why? What's it for? Worse, you need to use some packages if you have an AT and others if you have a PC or XT. It is just not clear enough, at least not for me.

IBM's overall documentation strategy is good, as far as I am concerned. However, it is incumbent on us, as users, to maintain the books over time. The EGA includes updates for the Guide to Operations, for example. Because there are different Guides for different PC models, I had some difficulty deciding what went where. Again, I wished for the roadmap.

Once inside the EGA documents, the installation went smoothly. It was more complicated than usual because the EGA can be equipped with piggyback memory options and must be jumpered depending on the display to be used (EGA supports IBM Monochrome, Color, and Enhanced Color displays). In addition, a set of DIP-like switches, accessible from the outside, must be set; for the first time in my IBM memory, the on and off positions of a switch are not clearly marked.

One thing that caught me was a protector that IBM installs on the piggyback pin connector of the EGA. Even though IBM includes a note about removing it, the protector looks like a female pin connector and is somewhat confusing. I would have gotten over this hump more quickly if the protector had been bright red instead of black, and IBM's note would have been clearer.

Hard Disk Fever

A couple of issues ago I talked about how I used my home system with electronic disk and how that strategy satisfied me even though I used an XT at work. I'm sorry to report that having an AT on my work desk has destroyed the harmony of my venerable PC.

Generally speaking, my RAM disk gave me performance similar to that of the XT. It did take some discipline on my part, but practice makes perfect. The AT, however, is a whole lot peppier than the XT. My personal PC seemed pretty pathetic by comparison. I became vulnerable. I weakened. I began to look at ads for hard disks. I began to consider the options. And then, it happened. Kamerman Labs lowered their price by $200, to $695, and I burned up the telephone lines getting my order to them.

The going price right now for ten megabytes of internal hard disk is $695, or less. Just about every mail order house has an offer in that price range. I'm satisfied with my purchase, and I thought I should tell you the basis upon which it was made and some of the other pertinent details.

To begin with, Kamerman is not the only choice. You should make your decision based on price and the reputation of the vendor. Also, look to see if the vendor you choose has other products. Some of the sellers of hard disk systems are in business right now only to take advantage of the price situation; next year, they might be selling pet rocks or hula hoops. A vendor with multiple products in the category (different sizes of hard disk, tape backup, external mount subsystems, etc.) is more likely to have a broader customer base and is thus more likely to be around when you need service. Ignore this advice if the price for the entire subsystem drops below $500: for that kind of money, you can afford to buy a new unit when the old one fails.

You should also carefully consider the power situation. A standard PC delivers 65 watts, enough to power the hard disk if the system is not overpopulated with boards. If you have a full house, however, you should seriously consider additional power. I decided to buy an IBM XT power supply as a spare

Figure 1. AUTOEXEC.BAT.

```
echo off
path c:\;c:\wp;c:\util;c:\dos;c:\comm
cd \util\sidekick
sk
cd \
cls
ver
tm
echo
echo ----------------------------------------------------
chkdsk
echo ----------------------------------------------------
prompt [$p]$g
set
echo on
```

TM is a Peter Norton utility that displays the date and time in a pleasing format. CHKDSK is included so that on every startup, the state of the hard disk can be seen. SET is used to verify the state of environment settings, like PATH.

part from my dealer. I paid a premium ($215 vs. $79 up from third parties), but I was willing to do so because I carry an IBM service contract on my system unit (the only part so covered) and wanted to keep the system as IBM as possible. Replacing the PC power supply with either IBM's XT unit or other replacement is easy.

Installing the Kamerman Megaflight was a little tedious but not complicated. It arrived with a half-height bezel mounted and a full-height bezel in the box. I needed the latter, and had to exchange them. That also required the addition of "legs" on the drive to get it to the proper mounting height; Kamerman supplies long bolts for this purpose. The cabling instructions are clear, and I had no trouble of note.

Kamerman's software for the installation process is quite good. Getting from a factory disk to an installed system was automatic, with the Kamerman program supervising the execution of the DOS programs FDISK and FORMAT. The system is ready to boot from the hard disk after this program runs.

A warning: before you take your system apart and remove disk drive B:, make copies of the Kamerman software as the manual suggests. I forgot, and it is a much slower process with only one floppy. Also, don't forget to set the system board switches to reflect one floppy so that DOS will behave properly if drive B: is ever mentioned again.

Most of the vendors of disk subsystems are using the same set of suppliers for the disk drive itself. This means that you can generally depend on the physical drive. The electronics are also moving in a common direction, with the controller chips coming from a small subset of manufacturers. I'd suggest only that you look for a one-year warranty on the whole subsystem and a return policy if, for any reason, you are unhappy with your purchase.

I did have to sacrifice something when the hard disk went in. I gave up my game port. I find myself wishing for an AST MegaPlus II instead of my original, gameportless MegaPlus, but maybe I'll solve the problem by buying an EGA to replace both my Monochrome and Color adapters; I'll pick up a slot in the process.

By the way, I had already upgraded my system with the new IBM ROM BIOS chip. If you have a PC whose serial number is smaller than 030060, you need the new chip if you want the system to boot from the hard disk. Every machine purchased after about April, 1983, has the new BIOS. Your dealer can help if you are uncertain.

Oh yeah, the end of the story. That XT power supply is noisy. Aurally, it can be heard across the basement; the original PC supply was much quieter. Electronically, it messes up the TV in my kitchen worse than the PC did; the PC garbled distant stations while the XT supply affects local stations on the low end of the VHF band.

Ah, progress. ■

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Jake Commander

First I'd like to say a big "thanks" to those of you who have taken the time to write to me with your ideas regarding this column. Forgive me for not being able to personally reply to all of you; there are simply too many letters to answer. Nevertheless, any that are of general interest, I'll address in this column. Your suggestions range from programs to reviews to more specific interests. In other words everyone would like to see everything. Ah well, nobody said it would be easy, and I'm happy to note that TRS-80 users are as enthusiastic as ever about their machines.

This month I'm devoting the column to a 6809 machine-code program for the Color Computer which I've entitled Chroma-Key. It is a utility that allows you to use the keyboard and screen in an enhanced mode something like (dare I say it?) the Commodore 64. Model I/III/4 users needn't feel left out though; a similar program for Z-80 people will follow in this column next month if space permits. This program is on the large side so it is split in two—half this month and half next. (Remember, too, the CompuServe subscribers can download the program from *Creative Computing* Online (PCS-22).) When you have the whole thing typed in and assembled, the following functions are available:

- Repeating keys with lowercase on Shift.
- Twenty-seven predefined keys. Shifted A to Z and Shift/right-arrow are all defined as various Basic commands.
- Redefinition of keys so that a single keystroke can enter a whole word or sequence of words. The whole definition table can be saved to or loaded from tape.
- A screen editor which allows entry and editing of characters on the video display. A special graphics sub-feature allows easy entry of low resolution graphic characters.

When the output feature is invoked, the keyboard definitions are saved on tape as a file named KEYDEF. I'm afraid I never did find time to add the disk save feature, so if anybody wants to volunteer, I'll be happy to include it in a future column. The list of predefined keys will appear next month after the end of the listing.

For those of you who have never tried your hand with EDTASM+ on the Color Computer, now is your chance. I should point out that this listing appears as output from the assembler during the assembly process. The first three columns printed by the assembler simply show addresses in memory followed by the bytes that are to be loaded there. As data-entry operator, you need to type in only the information that appears after each line number. If you are crazy enough, you can use the first three columns to key in the machine code in hexadecimal. (Does anybody still do that these days?) However, the more sane among you will fire up to EDTASM+— or whichever is your favorite editor-assembler—and start off by entering I10.

The line numbers in the listing are stepped in tens from 10 to 4820, so you have only 482 lines to enter without making a mistake. Dead easy. Now you see why this is in two parts.

Note that the version listed is for a 32K machine. To get the program working on a 16K machine, you will have to alter line 130 from 7C00 to 3C00; it's that simple. The comments in the listing serve to illustrate how the program works. I don't intend to go into further detail on that score, unless there is a demand for it, as this project already seems to be occupying the greater part of two columns.

Next month you'll have the second half of the listing along with the instructions to enable you to use the utility. ■

Color TRS-80 Chroma-Key listing.

```
                        00010 ********************************
                        00020 * COLOR TRS-80 Chroma-Key
                        00030 * Copyright 1985 Jake Commander
                        00040 ********************************
          0028          00050 LONG    EQU     40
          0004          00060 SHORT   EQU     4
          0027          00070 MSIZE   EQU     $27
          0088          00080 CURS    EQU     $88
          008A          00090 ZERO    EQU     $8A
          005D          00100 SEDT    EQU     $5D
          005F          00110 ENDM    EQU     $5F
          00            00120         SETDP   0
7C00                    00130         ORG     $7C00       ;3C00=16K
7C00      00            00140         FCB     0           ;TABLE END
7C01      00            00150         FCB     0
7C02      2C            00160         FCC     /,2-#TNIRPz/
          32 2D 23 54
          4E 49 52 50
          7A
7C0C      00            00170         FCB     0
7C0D      28            00180         FCC     /(NELy/
          4E 45 4C 79
7C12      00            00190         FCB     0
7C13      28            00200         FCC     /($RTSx/
          24 52 54 53
          78
7C19      00            00210         FCB     0
7C1A      28            00220         FCC     /(DNRw/
          44 4E 52 77
7C1F      00            00230         FCB     0
7C20      28            00240         FCC     /(LAVv/
          4C 41 56 76
7C25      00            00250         FCB     0
7C26      47            00260         FCC     /GNISUu/
          4E 49 53 55
          75
```

```
7C2C  00        00270          FCB   0
7C2D  4E        00280          FCC   /NEHTt/
      45 48 54 74
7C32  00        00290          FCB   0
7C33  24        00300          FCC   /$GNIRTSs/
      47 4E 49 52
      54 53 73
7C3B  00        00310          FCB   0
7C3C  4E        00320          FCC   /NRUTERr/
      52 55 54 45
      52 72
7C43  00        00330          FCB   0
7C44  24        00340          FCC   /$YEKNIq/
      59 45 4B 4E
      49 71
7C4B  00        00350          FCB   0
7C4C  28        00360          FCC   /(TNIOPp/
      54 4E 49 4F
      50 70
7C53  00        00370          FCB   0
7C54  28        00380          FCC   /(CSAo/
      43 53 41 6F
7C59  00        00390          FCB   0
7C5A  54        00400          FCC   /TXENn/
      58 45 4E 6E
7C5F  00        00410          FCB   0
7C60  28        00420          FCC   /($DIMm/
      24 44 49 4D
      6D
7C66  00        00430          FCB   0
7C67  44        00440          FCC   /DAOLC1/
      41 4F 4C 43
      6C
7C6D  00        00450          FCB   0
7C6E  22        00460          FCC   /"EVASCk/
      45 56 41 53
      43 6B
7C75  00        00470          FCB   0
7C76  28        00480          FCC   /(KTSYOJj/
      4B 54 53 59
      4F 4A 6A
7C7E  00        00490          FCB   0
7C7F  54        00500          FCC   /TUPNIi/
      55 50 4E 49
      69
7C85  00        00510          FCB   0
7C86  24        00520          FCC   /$THGIRh/
      54 48 47 49
      52 68
7C8D  00        00530          FCB   0
7C8E  4F        00540          FCC   /OTOGg/
      54 4F 47 67
7C93  00        00550          FCB   0
7C94  24        00560          FCC   /$TFELf/
      54 46 45 4C
      66
7C9A  00        00570          FCB   0
7C9B  45        00580          FCC   /ESLEe/
      53 4C 45 65
7CA0  00        00590          FCB   0
7CA1  41        00600          FCC   /ATADd/
      54 41 44 64
7CA6  00        00610          FCB   0
7CA7  28        00620          FCC   /($RHCc/
      24 52 48 43
      63
7CAD  00        00630          FCB   0
7CAE  28        00640          FCC   /(TNIb/
      54 4E 49 62
7CB3  00        00650          FCB   0
7CB4  42        00660          FCC   /BUSOGa/
      55 53 4F 47
      61
7CBA  00        00670          FCB   0
7CBB  28        00680          FCC   /(BAT /
      42 41 54 5D
7CC0  00        00690 KTBL     FCB   0
                00700 *
7CC1 B6 016A    00710 INIT     LDA   $016A
7CC4 A7 8C 1C   00720          STA   <SVC11,PCR   ;SAVE..
7CC7 FC 016B    00730          LDD   $016B
```


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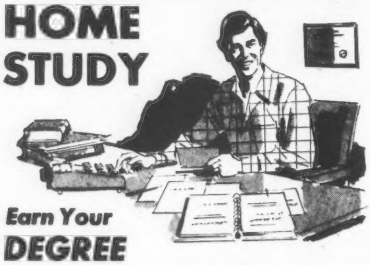

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Color TRS-80 Chroma-Key listing. *(continued)*

```
7CCA ED   8C 17    00740          STD     <SVCT2,PCR  ;...VECTOR
7CCD 86   7E       00750          LDA     #$7E        ;"JMP"
7CCF B7   016A     00760          STA     $016A       ;NEW VECTOR-
7CD2 30   8C 06    00770          LEAX    <CHRIN,PCR
7CD5 BF   016B     00780          STX     $016B       ;-INTO PLACE
7CD8 7E   AC73     00790          JMP     $AC73       ;TO "OK"
                   00800 *
7CDB 0F   70       00810 CHRIN    CLR     <$70        ;IOBUF UNFLUSHED
7CDD 0D   6F       00820          TST     <$6F        ;KBD I/P RQSTD?
7CDF 1027 0102     00830          LBEQ    PLRET       ;YES
7CE3 7E   0000     00840 SVCT1    JMP     >*-*        ;ELSE GO VCTR
          7CE4     00850 SVCT2    EQU     *-2
                   00860 *
                   00870 ********************************
                   00880 *
                   00890 *
7CE6      2C       00900 FPRS     FCC /,/
7CE7      AC       00910          FCB     $AC
7CE8      31       00920          FCC     /1,"KEYDEF/
          2C 22 4B 45
          59 44 45 46
7CF1      00       00930          FCB     0
                   00940 *
7CF2 8D   61       00950 OPTF     BSR     KBD         ;GET I OR O
7CF4 6F   8D 0142  00960          CLR     DEFINE,PCR  ;DEF OFF
7CF8 1F   89       00970          TFR     A,B
7CFA C4   DF       00980          ANDB    #$DF        ;TO UPRCASE
7CFC 30   8C E7    00990          LEAX    FPRS,PCR    ;=> PARAS
7CFF 9F   A6       01000          STX     <$A6        ;TO PARSER
7D01 BD   A5FF     01010          JSR     $A5FF       ;OPEN FILE
7D04 86   FF       01020          LDA     #-1         ;RESET..
7D06 97   6F       01030          STA     <$6F        ;..DEVNUM
7D08 31   8C B5    01040          LEAY    KTBL,PCR    ;=> KEYDEFS
7D0B 96   78       01050          LDA     <$78        ;FILE I/O MODE
7D0D 4A            01060          DECA               ;INPUT?
7D0E 27   15       01070          BEQ     INP         ;IF SO
                   01080 *
7D10 A6   A2       01090 A1       LDA     ,-Y         ;CHR FROM TBL
7D12 34   01       01100 B1       PSHS    CC          ;SAVE ZF
7D14 BD   A282     01110          JSR     $A282       ;O/P BYTE
7D17 35   01       01120          PULS    CC          ;ZERO?
7D19 26   F5       01130          BNE     A1          ;NO
7D1B A6   A2       01140          LDA     ,-Y         ;NXT TBL BYTE
7D1D 26   F3       01150          BNE     B1          ;MORE IN TBL
7D1F BD   A282     01160          JSR     $A282       ;O/P LAST ZERO
7D22 7E   A426     01170 CLOSE    JMP     $A426       ;ROM CLOSE RTNE
                   01180 *
7D25 8D   0B       01190 INP      BSR     A2          ;GET/STORE CHR
7D27 26   FC       01200          BNE     INP         ;NOT END DEFN
7D29 8D   07       01210          BSR     A2          ;GET/STORE CHR
7D2B 26   F8       01220          BNE     INP         ;IF NOT END TBL
7D2D 8D   F3       01230          BSR     CLOSE       ;CLOSE FILE
7D2F 7E   B958     01240          JMP     $B958       ;PRINT C/R
7D32 109C 27       01250 A2       CMPY    MSIZE       ;ROOM IN TBL?
7D35 22   05       01260          BHI     B2          ;IF SO
7D37 8D   E9       01270          BSR     CLOSE       ;ELSE CLOSE I/P
7D39 16   0191     01280          LBRA    OM          ;OM ERR
7D3C BD   A176     01290 B2       JSR     $A176       ;GET I/P CHR
7D3F A7   A2       01300          STA     ,-Y         ;INTO TBL
7D41 39            01310          RTS
                   01320 *
                   01330 ********************************
                   01340 *
7D42 AE   8D 0095  01350 RPKB     LDX     AUTO,PCR    ;AUTO MODE?
7D46 27   0D       01360          BEQ     KBD         ;NO-GET KBD CHR
7D48 A6   82       01370          LDA     ,-X         ;USE AUTO CHR
7D4A 26   02       01380          BNE     A3          ;IF NOT DEFN END
7D4C 9E   8A       01390          LDX     <ZERO       ;AUTO OFF
7D4E AF   8D 0089  01400 A3       STX     AUTO,PCR    ;UPDATE PNTR
7D52 27   01       01410          BEQ     KBD         ;IF AUTO END
7D54 39            01420          RTS
                   01430 *
7D55 8E   0028     01440 KBD      LDX     #LONG       ;CRNT DELAY
7D58 34   10       01450 G4       PSHS    X
7D5A 8D   4C       01460          BSR     FLASH       ;DO CRSR FLASH
7D5C BD   A1C1     01470          JSR     $A1C1       ;SCAN KBD
7D5F 35   10       01480          PULS    X
7D61 26   18       01490          BNE     I4          ;IF GOT CHR
7D63 30   1F       01500          LEAX    -1,X        ;COUNTDOWN
```

```
7D65 26   F1        01510          BNE     G4          ;SCAN TIL 0
7D67 C6   FF        01520          LDB     #$FF
7D69 86   08        01530          LDA     #8          ;ELSE CLR ROLOVRS
7D6B 8E   0152      01540          LDX     #$152       ;TO ALLOW RPT
7D6E E7   80        01550 H4       STB     ,X+         ;ZAP BITS
7D70 4A             01560          DECA                ;DONE ALL?
7D71 26   FB        01570          BNE     H4          ;IF NOT
7D73 8E   0004      01580          LDX     #SHORT      ;IN CASE RPT
7D76 BD   A1C1      01590          JSR     $A1C1       ;RPT CHR THERE?
7D79 26   03        01600          BNE     J4          ;YES, KEEP SHORT
7D7B 8E   0028      01610 I4       LDX     #LONG       ;RDY 1ST RPT
7D7E AF   8C D5     01620 J4       STX     <KBD+1,PCR  ;STOW IT
7D81 4D             01630          TSTA                ;GOT CHR?
7D82 27   D4        01640          BEQ     G4          ;NO KEEP GOING
                    01650 *
7D84 7D   011A      01660          TST     $011A       ;IN LWRCASE?
7D87 27   13        01670          BEQ     A5          ;YES-RTS
7D89 81   41        01680          CMPA    #'A         ;CHR A - Z?
7D8B 25   0F        01690          BLO     A5          ;NO
7D8D 81   5A        01700          CMPA    #'Z         ;CHR > Z?
7D8F 22   0B        01710          BHI     A5          ;YES, USE AS IS
7D91 34   02        01720          PSHS    A           ;SAVE CHR
7D93 BD   7D9D      01730          JSR     SHKEY       ;SHIFTED?
7D96 35   02        01740          PULS    A           ;RSTR I/P CHR
7D98 26   02        01750          BNE     A5          ;NO SHIFT
7D9A 88   20        01760          EORA    #$20        ;RVRSE CASE
7D9C 39             01770 A5       RTS
                    01780 *
7D9D 86   7F        01790 SHKEY    LDA     #$7F        ;MASK FOR SHIFT
7D9F B7   FF02      01800          STA     $FF02
7DA2 B6   FF00      01810          LDA     $FF00       ;CHECK KBD ROW
7DA5 84   40        01820          ANDA    #$40        ;EXTRACT SHIFT
7DA7 39             01830          RTS
                    01840 *
7DA8 109E 88        01850 FLASH    LDY     <CURS
7DAB E6   A4        01860          LDB     ,Y          ;CHR AT CRSR
7DAD 86   8C        01870          LDA     #$8C        ;"DEFINE" CRSR
7DAF 6D   8D 0087   01880          TST     DEFINE,PCR  ;DEFINING?
7DB3 26   1A        01890          BNE     Q6          ;USE DEFINE CRSR
7DB5 6D   8C 22     01900          TST     <SESW,PCR   ;SCRN EDIT?
7DB8 26   03        01910          BNE     SCSR        ;YES
7DBA 7E   A199      01920          JMP     $A199       ;NORMAL FLASH
7DBD 8D   09        01930 SCSR     BSR     P6          ;FLASH CRSR CHR
7DBF 109E 5F        01940          LDY     <ENDM       ;=ENDM OR ZERO
7DC2 E6   A4        01950          LDB     ,Y          ;ENDM CRSR CHR
7DC4 03   05        01960          COM     <$5         ;EVERY OTHR TIME
7DC6 2B   09        01970          BMI     R6          ;FLASH IF NEG
7DC8 86   2B        01980 P6       LDA     #$2B        ;WHITE CROSS
7DCA 5D             01990          TSTB                ;GRAPHIC CHR?
7DCB 2B   02        02000          BMI     Q6          ;YES
7DCD 86   80        02010          LDA     #$80        ;ELSE USE BLACK
7DCF A7   A4        02020 Q6       STA     ,Y          ;TO VIDEO
7DD1 8E   017A      02030 R6       LDX     #$17A       ;DELAY COUNTER
7DD4 BD   A7D3      02040          JSR     $A7D3       ;DO DELAY
7DD7 E7   A4        02050          STB     ,Y          ;REPLACE CHR
7DD9 39             02060          RTS
                    02070 *
7DDA      00        02080 SESW     FCB     0           ;SCREEN EDIT
SWITCH
7DDB      0000      02090 AUTO     FDB     0           ;DEF'D CHR PTR
                    02100 *
                    02110 **********************************
                    02120 *
7DDD E6   8C 5A     02130 CHDA     LDB     <DEFINE,PCR
7DE0 EA   8D FFF7   02140          ORB     AUTO,PCR    ;NZ IF EITHER
7DE4 39             02150          RTS
                    02160 *
7DE5 32   62        02170 PLRET    LEAS    2,S         ;PULL RET
7DE7 34   74        02180 KBIN     PSHS    B,X,Y,U
7DE9 17   FF56      02190 KCHR     LBSR    RPKB        ;GET KBD CHR
7DEC 30   8C FA     02200          LEAX    KCHR,PCR    ;RETURN ADR
7DEF 34   10        02210          PSHS    X           ;TO STACK
7DF1 6D   8C E6     02220          TST     <SESW,PCR   ;SCRN EDIT?
7DF4 1026 00F2      02230          LBNE    SCNEDT      ;IF SO
7DF8 C6   60        02240          LDB     #$60        ;CRSR CHR
7DFA E7   9F 0088   02250          STB     CURS        ;IN CASE BSP
                    02260 *
7DFE 81   03        02270 CHBR     CMPA    #3          ;BREAK KEY?
7E00 26   2B        02280          BNE     CHKAUT      ;NO
```


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APPLE CART

Yes, a Color Mac; the width myth; Thunderscan; Hyperdrive hard disk; Alphacom Daisywheel

John J. Anderson

Happy Spring to you all, Apple Fans. Lots has been going on in the Orchard lately, and the real task of the Apple Cart is deciding what will be included, as opposed to what won't. There are so many products and issues that fairly cry out for mention, and our space is limited.

Our II series maven Mr. Linzmayer has been so buried with work that his IIc coverage did not make it to us by press time—rest assured the next column will be devoted solely to the II series. We have heard from many of you concerning splitting the Apple Cart, and are giving the idea serious consideration. Perhaps we will devote a new feature to "desktop metaphor machines," so the Cart can return specifically to the Apple II series. Owen is evaluating his IIc LCD for next month.

Color Mac Sighted

You may or may not remember the caution we originally attached to that most ubiquitous of Mac rumors: color. I suggested in the July 1984 *Creative* that holding one's breath was inadvisable, for the appearance of a color Macintosh was very far off. That advice was, and remains, on the mark.

But confirmation has arrived. It has taken a year, but we have heard from an unimpeachable source about a color version of the Macintosh computer. We don't know very much more than that at least one unit exists, and that some privileged personnel have had an opportunity to see it.

And when will *we* finally get to see it? Well, if the long-awaited Commodore Amiga machine finally makes its debut, sporting Mac-like capabilities in color for the cost of a monochrome Mac, Apple may begin to think about an early introduction of its own hi-res color machine. If Atari's ST series machines are viable and begin to ship, this will add to the Color Mac pressure. Our only hope is that the color resolution will be up to snuff. Anything less than crystal clarity, rivaling that of the monochrome Mac, will be unacceptable.

The Width Myth

Is the Apple Macintosh, with its Motorola 68000 processor, a 16-bit or 32-bit machine? I have pegged it as a 32-bit machine in the past and taken a lot of heat for that. I am fully aware of the complexities of the argument, and frankly have ducked the issue as long as possible. Like benchmarks, these sorts of judgments invariably and quickly lead to partisan politics.

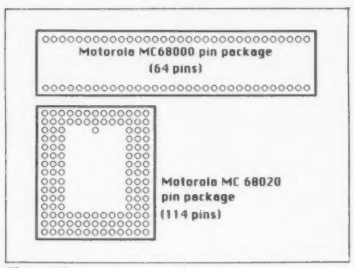

Figure 1.

Here's a magnificent hedge for you: Although the 68000 has some limitations that cause it to be regarded as a 16-bit MPU, it is probably fair to say that the Mac is as much a true 32-bit machine as the IBM PC is a true 16-bit machine. And IBM zealots have certainly tried to position the 8088 inside the original PC as a 16-bit machine, even though that MPU employs a data path a mere eight bits wide. The 68000 exhibits many of the features of a 32-bit machine, with a 16-bit data path. It uses a 24-bit address bus, which gives it the capability to address 16 megabytes on the fly. All internal registers are 32 bits wide, with the exception of the 16-bit status register. There are 15 general registers, and two stack pointers. Show me another 16-bit processor that can access that kind of memory with such versatility!

Some of you have written to ask if the MC68000 within the Mac can ever be upgraded to the new Motorola 68020, which is, with its 32-bit data path to memory, undeniably a "true" 32-bit microprocessor. The answer to this is no. Although the 68020 supports the 68000 instruction set entirely and is designed to maintain strict software compatibility with its older sibling, its pinouts are not in dual-inline package (DIP) configuration. Rather, the flip side of Motorola's 32-bit chip sports a whopping 114 separate connecting pins in a configuration that might be labeled as a "quad" or "QIP" layout—three pins wide on all but a single side (see Figure 1).

Of course, in addition to the fact that the physical layouts are incompatible, many of the signals that are multiplexed (more than one signal sharing a common circuit) on the 68000 have their own discrete pinouts on the 68020. Although one might imagine some fanciful kludge to surmount these problems, it is realistic to surmise that the effort would not be worth the result. Current Mac circuitry is simply not devised to make use of the advantages of a 32-bit data path. For that we'll have to wait for a new crop of machines.

ThunderScan

Collegiate Owen Linzmayer is now hard at work on a special section for our next graphics issue. It consists of an examination and round-up of digitization packages. In it he compares imaging systems for a wide range of machines. The piece will be quite comprehensive, and I am looking forward to it.

I promised him I would not jump the gun concerning Macintosh imaging systems, but I cannot help but make passing mention of the ThunderScan, from Thunderware, in Orinda, CA. This self-contained hardware and software system does not require an external camera and gives superb results for a total investment of $230 list.

The ThunderScan is a unique device, which replaces the ribbon cartridge in your Imagewriter printer. You load an original into the printer and the scanning unit sends a digitized image to the Macintosh. Though the process is somewhat lengthy, as it depends on the fixed mechanical speed of carriage returns and incremental linefeeds of the printer, it outputs high quality images. So im-

pressed are we with our results that we have had to fight down the urge to digitize every piece of paper in the lab.

Details of our adventures with ThunderScan will have to wait for Owen's round-up, but suffice it for now to say that working with it is a joy. The software is very good and allows you to view an image in a full-screen window. Images can be saved with all grey-scale information intact (make sure you have some room on disk) or as straight *MacPaint* documents. Scanning can take place from 25% to 400% of the original image size, and brightness as well as contrast sliders exist in software. The software allows for high contrast or half-

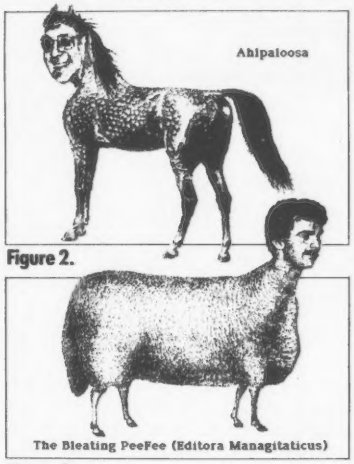

Figure 2.

Figure 3.

tones, and rehalftoning can be effected without having to rescan.

The possibilities of this product are endless, and it has fired up our imaginations quite a bit (Figures 2 and 3). Already our logo has been digitized and is available in the Apple Cart library (DL7) on Creative Computing Online (CompuServe PCS-22). That library will surely grow. Stay tuned for a comparative review of the product. Or better yet, go out and buy one while you're waiting.

Hyperdrive

In February I wrote concerning the Hyperdrive, which you may remember is the 10 meg internal hard disk for the Mac, from General Computer of Cambridge, MA. Well Pax Goodson of GCC drove down the other day to give me a hands-on demonstration of the product.

It's for real, folks, and then some. I watched Pax boot up from hard disk with no floppy inserted. I watched him boot *MacPaint* in a matter of seconds. I watched him create a *MacWrite* document, cut it to the clipboard, close, then open a new document, and do a paste, all in under 12 seconds. This parallel drive, as opposed to external drives which rely on the modem port for serial interface, is fast. It is so fast, you'd be hard pressed to tell that you were not looking at a RAMdisk in action.

The superquiet internal fan doesn't give the RAMdisk impression away either. I have a Tecmar drive, which occasionally does an uncanny impersonation of a Learjet, especially when it's been in use over the course of an entire day. I was fearful that the Hyperdrive fan, inside that potential soundbox that is the Mac, would make the Mac sound like (horrors!) an IBM machine. Such is not the case.

According to General Computer, the firm has received orders with a total retail value of over $2 million since introduction a mere four months ago. Word has it that Steve Jobs said this little hardware miracle could never be created (perhaps he stipulated to his designers that it shouldn't be do-able). But here it is, and it makes the Mac work the way it should—fast. I can give no better recommendation than to say that I put in an order on the spot.

The software included with the hardware system is superlative, and features many conveniences to make sector allocation and security measures a breeze to deal with. The downside: installation must be done by your dealer. To reiterate a bit of the February piece, prices are $2200 for the drive alone, installed, and $2800 installed alongside an upgrade to 512K.

A full review of the Hyperdrive will appear in an upcoming issue.

Alphacom Letter Quality Daisywheel

The Imagewriter is a pretty darned nice printer for graphics, but let's face it—it isn't exactly the greatest text printer you've ever seen. Mac owners certainly wouldn't want to be without an Imagewriter, but when it comes time for those formal business letters or grant proposals, you might find yourself edging back toward the Selectric. I know I have.

The Mac market is ripe for a low-cost, high quality daisywheel printer, which Mac owners can put inexpensively alongside their existing Imagewriter. The Alphacom Daisywheel is just such a printer, and at $430 complete with interface and cable, comes at an unbeatable price.

The specs in brief: the Alphacom Daisy clocks in at 22 cps, in 10, 12, or 15 cpi, with optional proportional spacing. The printer is friction feed only, with a form width of up to 13". The printwheels as well as ribbon cartridges are Diablo and Qume compatible. Buffer size is 93 bytes, expandable optionally to 4K. The Alphacom measures 19" x 5.5" x 12" and weighs 21 lbs.

Print quality is impeccable (Figure 4), and the system runs quietly for a daisywheel. The Alphacom Letter Quality Printer uses inexpensive modular interfaces ($30 each). Using the Mac-

```
!"#$%&'()*+,-./
0123456789:;<=>?@
ABCDEFGHIJKLM
NOPQRSTUVWXYZ
[\]^_`
abcdefghijklmnopqrst
```

Figure 4.

intosh interface, we drove the printer reliably both from the *Daisywheel Connection* and Microsoft *Word*. Setting up the unit is easy, and the accompanying documentation is relatively thorough and competent.

Catch you next month. ■

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OUTPOST: ATARI

Programs for the home, a new adventure, and unsung heroes

David Small

It is almost summer. As you know, during the summer you can be outdoors doing all sorts of healthy, active things, or you can be inside using the computer. This month I have made it my mission to persuade you to stay inside and avoid the aging effects of the sun rays.

To this end, let's look at a few products that might keep you chained to your Atari.

Wombats I

So you think you've seen everything there is to see in Adventure games? You've saved the Princess, cleansed the realm of ultimate evil, prevented a meteor from colliding with the Earth, and just generally saved the universe from the alien challenge?

Congratulations, you are an adventure burnout. Welcome to the club.

When *Wombats I* arrived, I yawned. I wondered what task (which I had undoubtedly already completed in another game) would await me. Slay a troll? Big Buzz. Find gold? No sweat. So I booted the game up:

"Episode I: Gazumba the Great and the Wombats of Borazoa. You are standing on a large compass. The compass has been made out of hundreds of tiles; the placement of the tiles is extremely exact, and must have caused the being who did the work to go prematurely blind." Without really seeing what was on the screen, I wandered on.

"This is the computer system room, where there are visible remains of several mainframe computers. A host of smaller computers are huddled around them for warmth."

In another room, a mysterious inscription on the wall:

"I sit on my legs, and quietly think
about what it all means
about why there is no mayonnaise
jam
or how Brooke gets into her jeans."

Double take. I was confused. What on earth? Several scenes later it all became clear: *Wombats I* is a parody of adventure games.

I picked up the cover and read: "Venture with me into a mind-boggling world of strange creatures, killer vegetables, dim-witted robots, and weird happenings. Equipped with an extensive vocabulary and written entirely in Demento-O-Matic machine language for fast, fast, FAST execution, *Wombats I* sports many sophisticated commands heretofore only available elsewhere. The fruit of our labors can now be yours, if you promise not to pirate it all over creation. Boola, boola."

Well, I haven't completed the game yet; it has some pretty hard puzzles. Besides, I'm still enjoying the prose that has been so carefully crafted. No hurry.

Venture with me into a mind-boggling world of strange creatures, killer vegetables, dim-witted robots, and weird happenings.

I recommend this one to experienced Atari adventurers who think they have seen it all. If you are not an experienced adventurer, start with *Zork I* or the Scott Adams series; a lot of the humor in this game is directed at the competition, and if you haven't played the other games, it will fall flat.

A few caveats: The actual game is quite difficult to solve. To me, that is unfortunate. I think the object of a parody adventure should be to expose the player to the maximum number of parodied rooms and such, and if he can't get far into the game, he will not derive maximum enjoyment from the game. The game play is quite uneven in spots; more play-testing might help a lot.

Finally, it is truly copy protected. I mention this because it won't boot on an ATR-8000, and that means other non-Atari drives could have trouble; it seems to depend on the data separation scheme being used. Atari 810s and 1050s work fine; if you use anything else, test it out first and reserve the right to return the game if it fizzles.

All in all, my rating is Good Enough.

Homepak

Russ Wetmore has done it again. Longtime Atarians remember Russ as the fellow who wrote *Preppie*, one of the classic Atari arcade games. With *Homepak*, Russ has proven that his skill as a programmer extends beyond games.

Homepak, from Batteries Included, is three programs in one: a word processor, a database, and a telecommunications program. What is amazing is that all three programs are pretty good, and the price for all three is $49.95.

Homepak is written in Action, a language that is emerging as the preferred language in which to develop Atari software; it is fairly high level, but compiles into extremely efficient code. Action is what I had hope Forth would turn out to be—easy to use and powerful enough to drive the Atari to its limits.

The idea of *Homepak* is to combine the functions that a home user might need at a reasonable price.

Hometext, the word processor, is good enough for most home use; it isn't exactly industrial strength, nor can it handle 100K manuscripts (more like 8K). On the other hand, most home users don't write long documents; they write letters and other documents for which Hometext is adequate. It has the usual word processing capabilities; margins, block move/delete, and search/replace. There is also a page setup menu which has many capabilities from justification to footers and line spacing.

Homefind, the database, tries to fulfill the needs of the *home* user, and to my mind, does this difficult task effectively. With the database, you enter facts you want to be able to recall later, in the following format: "Robert's birthday March 23, 1953"; "Mike's phone's 929-9099"; "Susan's favorite color's yellow"; and save them. Then, you can recall

them with "natural language" commands like "What is Mike's phone?"

This is an interesting idea. It lets you store information that is normally difficult to get into a database, because of the wildly differing fieldnames and lengths. It is not a powerful database in the mold of *Filemanager*; rather, it is a convenient fact file for information. It is also considerably easier to use than *Filemanager* for the sort of information an average home user wants to save.

Finally, there is Hometerm, a terminal program. This program lets you use the Atari as a terminal with most modems available today, including those that direct connect (1030), those that work with the 850 Interface, and the MPP series which plugs into the joystick ports. Hometerm lets you select baud rate, autodial, upload and download Atari DOS files with XMODEM protocol, and even edit and compose text lines in the program before sending them through the modem.

I like Hometerm and think it is easier to use than either *Telelink* or *Amodem/Tscope*.

Homepak gives you basic functions at a reasonable price. It is a real rarity on the market today, an excellent program at a bargain price.

(If you need a really powerful word processing/database/telecommunications program and can bear the tariffs let me suggest the following: pick up an ATR-8000 with as much disk storage as you need and get the CP/M-80 versions of *WordStar, dBase II*, and *Modem7*. You'll find that CP/M has the necessary disk I/O speed and power to handle most problems. On the other hand, you're going to put a real drain on your checking account balance by the time you're done, so consider carefully "how fast you want to go".)

CompuServe

Many Atari users now dial into CompuServe and visit the Atari SIG (Special Interest Group) there. If you have never tried out a bulletin board system, think of a shopping center "bulletin board" that thousands of users can post bulletins on and respond to daily, and you'll get the idea. It is *the* place to pick up rumors, ask questions, and get some good answers. The operators of the Atari SIG are among the most knowledgeable of Atari programmers (Russ Wetmore, mentioned above; Steve Ahlstrom and Dan Moore, who did *SynCalc* from Synapse; Ron Luks; and others).

Also on *CompuServe*, in *Creative Computing* Online, you will find *Creative's* own John Anderson and Owen Linzmayer. If you want immediate response to comments about articles, suggestions, and the like, this is the place. I check into *CompuServe* once every few days, so if you leave a message for me in the *Creative Computing* Outpost: Atari area, I'll be able to respond immediately.

The idea of Homepack is to combine the functions that a home user might need at a reasonable price.

Dave's Recognition Corner

Finally, this month we have a place where some of the "movers and shakers" in the Atari world can be recognized for their contributions. Each month I'll try to mention a few people who deserve kudos from Atarians.

Joe Miller (formerly of Atari, Inc.): Wrote the operating system, far ahead of its time, for the 400/800 computers. Try to do some of the things Atari programmers can do so easily (such as reading a file a byte at a time) on other machines. You'll really appreciate Joe's work the first time you use another machine's Basic.

Bill Wilkinson (OSS, Inc.): Wrote Atari DOS; then marketed Steven Lawrow's MAC/65, the finest 6502 assembler available for the Atari, and Action. Truly a person whose tools and company played a critical role in software development for this machine.

Ihor Wolosenko (Synapse, Inc.): The person who started and built up Synapse Software, starting with *FileManager 800* and moving to some of the really classic games, including *Shamus, Blue Max, Dimension X*, and *Protector*. A person who gave many programmers their first chance to write and market an Atari game.

Earl Rice and Mark Cator (formerly of Atari Inc. User Support Group): Two people who put a lot of work into helping user groups, distributing educational tapes, disseminating information, straightening out problems, and helping users. Special thanks for the many trips they made to user group meetings around the country; Earl and Mark were the only employees of Atari many people ever met.

Delaine Goode, Jill Palmquist, Joe Wagner (Corvus Inc.): Still the only manufacturer of a hard disk for the Atari. Possibly a tool ahead of its time, yet an increasingly popular tool for software developers; much faster than Atari drives (4-8X speedup) and lots of storage (5-20Mb). Delaine, Jill, and Joe have bent over backwards to support Atari users when many perceived the Atari computer as "just a game machine."

Chris Crawford (formerly of Atari, Inc.): One of the people most responsible for the success of the home computer. Helped write an excellent text (*De Re Atari*) on how to use the machine which got many programmers started. He made many personal appearances at user's groups and seminars explaining how the machine works. Chris is also responsible for popularizing the "smooth scrolling" and terrain map techniques which appear in hundreds of Atari programs; they were first seen in his brilliant *Eastern Front*.

He is also one of the most pleasant people I have dealt with at Atari. Chris is now writing programs for the Macintosh.

And finally, **George Blank**, former *Creative Computing* editor, who originated the Outpost: Atari column and gave two novice writers (David and Sandy Small) a place for their Atari tutorial series nearly four years back. Many thanks.

See you next month, when I anticipate having some hard information on the ST line (68000 machines) as well as the more secret NSC 32032 32-bit line, as well as our Fourth Anniversary Special. ■

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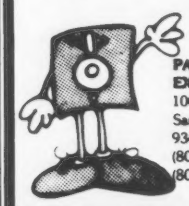

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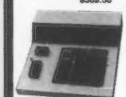

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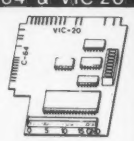

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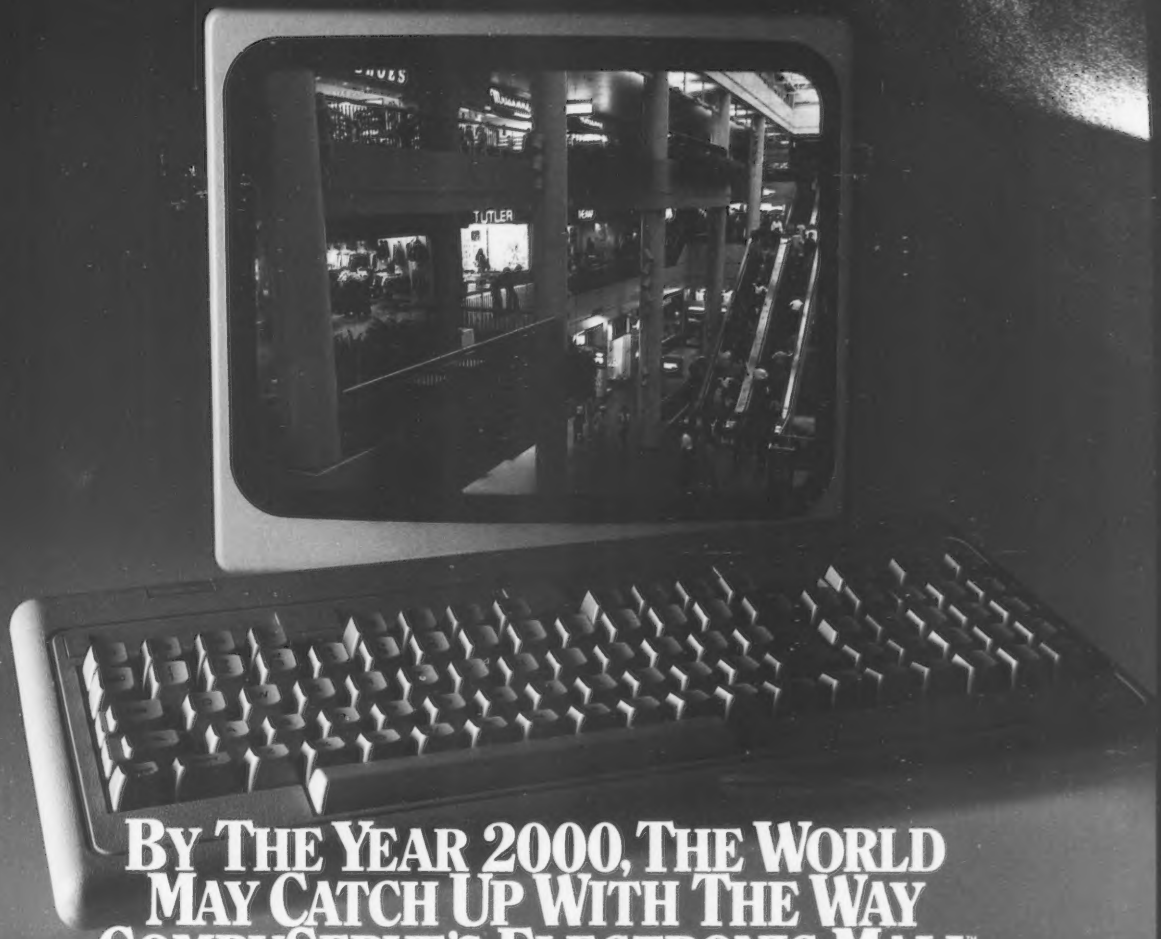

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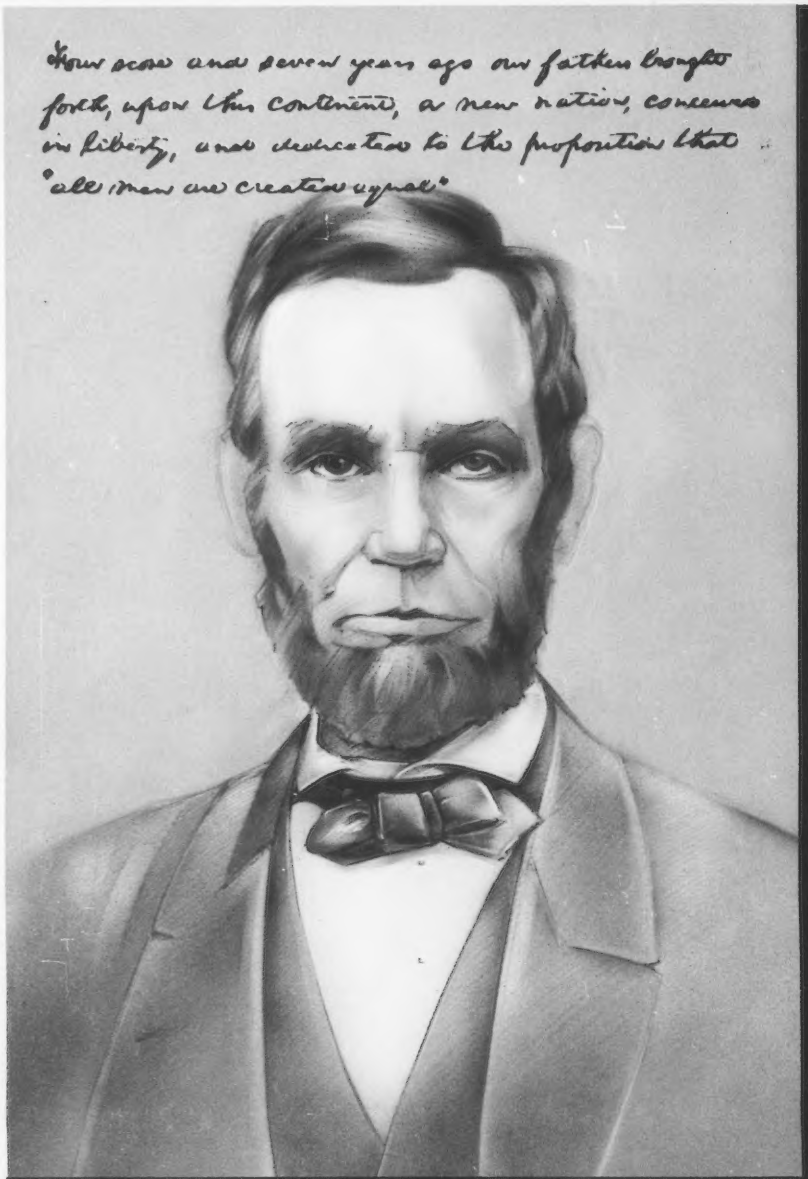
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